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ORGANISATION OF THE AGRICULTURAL INDUSTRY.

The Queensland Producers' Association.

Monthly Record of Progress and Achievement.

The September Session of the Council of Agriculture was held in the Conference Room, Teachers' Training College Building, Turbot street, Brisbane, on Thursday, 21st ultimo. Subjoined is a complete record of Proceedings covering many matters of first importance to the Farming Industry.

ATTENDANCE.

In the absence of the President (the Hon. W. N. Gillies), who was in Melbourne on business in connection with the meat industry, the Vice-President (Mr. J. Purcell) presided.

There were also present: Messrs. H. C. Quodling, J. W. Davidson, W. J. Short, F. M. Ruskin, H. I. H. Ross, W. Ranger, S. J. Howe, F. J. Morgan, T. Muir, R. Swan, T. A. Powell, W. G. Bachelor, G. H. Pritchard, C. V. Hives, H. Keefer, W. Purcell, T. Flood Plunkett, J. D. Story, and J. F. McCaffrey (Secretary).

THE DIRECTOR WELCOMED.

Mr. L. R. Macgregor, the newly appointed Director of the Queensland Producers' Association, was officially welcomed by the members of the Council, and in the course of a brief acknowledgmeent he expressed his appreciation of the honour conferred upon him in being invited to organise the big undertaking upon which the Council had embarked. He had not underestimated the immense possibilities for the benefit of agriculturists and the State as a whole which lay ahead of the movement that the Council had brought into being.

"A Record to Lose."

"I came here," remarked the Director, "with a record to lose. There are few of the big agricultural schemes which have recently been brought into being in the Western State with which I have not been associated in some way or other, and I think that I can say that I have left behind over there a few monuments." Continuing, Mr. Macgregor said: "I was privileged to enjoy the confidence of the agriculturists over there, and I thank you for the faith you have shown in me in asking me to come here. Confidence will be a matter of development. I trust that, as the days go by, your preliminary faith in me will develop into actual confidence and trust.

"Much has been accomplished by you in the way of preliminary organisation. I have had an opportunity of examining this in a casual way during the past day or two, and I should like to take this opportunity of congratulating all concerned on what has been done. I feel that the foundations of the structure have been well and truly laid.

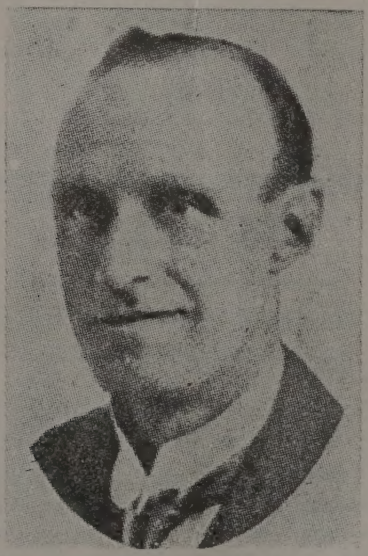


Plate 52.—Mr. L. R. Macgregor,
Director of the Queensland Producers' Association.

Unity and Co-ordination Essential.

"I would like to congratulate the agriculturists of Queensland," continued Mr. Macgregor, "upon the way in which they have already organised themselves in various directions; for example, in the sugar and butter industries. In wheat, too, you have an object lesson here. The steps which have been taken by the primary producers in Queensland are being watched by producers in other States. Your influence has been felt elsewhere. Still there is much more to accomplish. There has not hitherto been that co-ordination of effort which is so necessary. The most pressing agricultural problems are national, and not sectional. They must be examined and solved from the broader standpoint, and the organisation which you have brought into being affords an adequate means whereby primary producers of all sections may act and work together for their common good. Without that essential co-ordination and the unity of the producers into one organisation, those problems cannot be properly tackled.

"One has only to mention such matters as conservation of fodder, finance of agricultural development, and stabilisation of prices, to realise that action by any

one section of agricultural industry would be well-nigh valueless. You have now in the Council of Agriculture that which you formerly lacked—viz., means whereby producers as a whole may speak with one voice and act in unison in seeking to solve their difficulties and effect pressing and necessary improvements.

From the Abstract to the Concrete.

"Some of these terms that I have used—Conservation of fodder, co-ordination of effort, stabilisation of prices, and exploiting of new markets—are all terms which have been talked glibly for long. It is now for this organisation to translate into action and give definite shape to these things which have hitherto been in the nature of ideals."

In the course of further observations, Mr. Macgregor emphasised the importance of what sometimes is considered the subsidiary sections of the industry. He instanced eggs and honey, and in stressing this point stated that, although the United States of America is the greatest wheat-producing country in the world, the value of the eggs produced there is greater than the value of the wheat production. He referred to the value of organisation in creating a local market for honey in one of the other States, and said that this principle could be applied to some of Queensland's primary industries which are at present in a struggling condition.

From early years he had been associated with agricultural problems. He felt that in their scheme were potentialities of immense value to the producers of this State, and his best energies would be devoted to the service of the man on the land.

ADMINISTRATIVE COMMITTEE.

Duty on Imported Maize.

In connection with the duty on imported maize, a communication had been received from the Tariff Board to the effect that the duty on imported maize is 3s. per cental, but under the tariff agreement between South Africa and the Commonwealth maize of South African origin is admitted into Australia at a duty of 1s. per cental.

"The question of increasing the duty on maize from South Africa," the communication stated, "is to be considered in connection with the new reciprocal tariff arrangements that are to be made between that country and the Commonwealth."

The Council recommended that the reply from the Tariff Board be noted, and the following recommendations were approved:—

(i.) That the Director be requested to collaborate with the Wheat and General Committee for the purpose of preparing a brief but lucid statement as to the importance of the subject to maizegrowers.

(ii.) That such statement be communicated to Local Producers' Associations, and that they be invited to pass a suitable resolution to the effect that the Council make strong representations to the Tariff Board in favour of the recognition of the request of Queensland maizegrowers for an increased tariff on South African maize when the new reciprocal tariff arrangements are being made between the Commonwealth and the South African Union.

(iii.) That such resolution be forwarded to the Minister for Trade and Customs and to the Queensland members of the Senate and of the House of Representatives.

(iv.) That when the statement has been prepared it be communicated to the Press with an intimation as to the action which the Council of Agriculture is taking.

Advisory Board for the Fruit Industry.

The selection of producers' representatives on the State Advisory Board of the National Council of Fruitgrowers was approved by the Council of Agriculture as follows:—

(*a*) The members of the Fruit Standing Committee of the Council of Agriculture—namely, Messrs. T. H. Brown, S. J. Howe, W. Ranger, H. I. H. Ross, and F. M. Ruskin;

(*b*) Together with Messrs. Myles Fox, L. R. Macgregor, and J. R. Morris.

This Committee was directed to work in co-operation with the Council of Agriculture.

Local Producers' Association—Farmers Enrolling

The Supervisor of District Agents reported that very satisfactory progress is now being made by the district agents in the forming of Local Producers' Associations in their respective districts. Reports indicated that the policy approved by the Council in connection with the reorganisation of agriculture is receiving the support and co-operation of producers in all centres. At the present time 230 Local Producers' Associations have been formed, and 4,500 primary producers enrolled as members of the Queensland Producers' Association. Successful meetings have been held recently in the North, notably on the Atherton Tableland, Townsville, and Ayr districts, and large numbers of producers in each centre have enrolled. Similar satisfactory progress is reported from the North Coast, the Downs, and Western districts, where excellent enrolments have taken place. Provision has been made to enable producers in centres which have not yet been visited by the district agent to form local associations where such associations are not already in existence. This step has been taken in view of the fact that to enable producers in each centre to have a voice in the election of councillors, a Local Producers' Association must be formed not later than 30th November next.

Assistance in Water-finding.

The question of securing water supplies, being of paramount importance in the successful settlement of agricultural areas, which suffer periodically from inadequate rainfall, was a recommendation submitted for consideration by the Council on behalf of the producers resident in such areas. The Department of Public Lands advised the Administrative Committee that a tentative proposal designed to afford settlers in these areas with facilities for securing water has been formulated by officers of the Department, and the scheme has been under consideration by the Government for some time. The Government, however, has not yet arrived at a decision on the matter. The main difficulty, the Department advised, is finance, as obviously any such scheme must involve the outlay of considerable sums of money. An officer is employed by the Department, whose sole duty is to locate sites for obtaining subterranean stores of water. The services of this officer are made available at a purely nominal fee to all selectors throughout the State. It was decided that the Council of Agriculture make further inquiries as to possible future developments in the direction indicated.

Architectural Assistance.

In the opinion of the Administrative Committee it was thought desirable that the Council should be in a position to offer helpful advice and suggestions to producers in the matter of designs of buildings and equipment for butter and cheese factories, storage accommodation for fruit, and in other directions, and to that end the Committee recommended that the Council appoint a consulting architect, to be paid only for services rendered to the Council from time to time. The recommendation was approved, and it was decided that the consulting architect be asked to prepare suitable plans for a storage plant at Mapleton, with appliances to cope with 30,000 cases of oranges.

Administrative Staff

In connection with the permanent positions which it will be necessary to establish, the Administrative Committee was authorised to confer with the Directors regarding the duties to be allotted to each position, the salaries to be paid, and the conditions of appointment in each case.

DAIRY COMMITTEE.

In submitting his report to the Council, the Chairman of the Dairy Committee desired that the Commissioner for Railways be thanked for the assurance given at the recent meeting of the Transport Committee that no discrimination would be made in applying the 20 per cent. reduction to all dairy produce carried over the Queensland railways, irrespective of destination.

Stabilisation Scheme

Notwithstanding that butter factories in other States have agreed to fall in with the stabilisation proposals, and to stand by the producers, reports from Melbourne indicate that adverse propaganda in Victoria has induced ten factories to oppose the scheme. The acceptance of the scheme was conditional upon practically the whole of the butter and cheese manufacturers adopting it and binding themselves to abide by the agreement. In view of its importance to Australian dairymen, a further effort on the part of the Dairy Committee will be made to induce the opposing factories in Victoria to come into the scheme. Messrs. T. Flood Plunkett, W. Purcell, and W. T. Harris, who proposed to visit Melbourne for the purpose of attending the Federal Dairy Council meeting, were requested to endeavour, while in the Southern State, to induce the directors of the factories standing out to adopt the proposal which has for its objective the betterment of those engaged in the dairying industry and the maintenance of a fair price for their products.

Uniform System of Accountancy.

The desirability of a uniform system of accountancy for butter factories and kindred enterprises was urged by the Committee, and the Council approved of the appointment of a small expert committee to consider the whole question and report thereon to the Council.

FRUIT COMMITTEE.

The Fruit Committee recommended:—

(i.) That concrete instances of loss of empty cases from canneries be brought under the notice of the Committee.

(ii.) That in the opinion of the Fruit Committee the most effective way to guard against ravages by marsupials is by the erection of wire netting around orchards, and with a view of enabling growers to obtain wire netting at a reasonable price it is desirable that the netting should be purchased through co-operative channels in connection with the general question of co-operative buying for agricultural requirements.

(iii.) That every possible protection be afforded to insectivorous birds, and that the Department of Agriculture be asked to afford protection to such birds.

(iv.) That an effective system of centralisation be adopted in regard to canning factories; that legislation be introduced in connection with the rough handling of fruit.

(v.) That the particulars relating to the prohibition of flashlights be brought under the notice of district agents and Local Producers' Associations.

(vi.) That it be suggested that the subjoined minute be brought under the notice of the Director of Forests, with an intimation that the Local Producers' Association at Woombye reports that this is a serious matter to fruitgrowers:—

That pine logs and tops used for the construction of fruit cases be not subjected to Government royalty, and that action be taken to make those conditions apply to a large sawmill where case-manufacturing expenses can be reduced to a minimum.

The recommendations of the Fruit Committee were all approved.

THE FUTURE OF THE SUGAR INDUSTRY—CONSIDERED BY THE COUNCIL OF AGRICULTURE.

The Case for the Renewal of the Federal Agreement.

"The continuance of the Sugar Agreement is of vital importance to Queensland and Queensland producers, and to the Commonwealth as a whole."

"The burden of the 'WHITE AUSTRALIA' policy is practically being borne by the sugar industry of Queensland, as the settlement of our Northern littoral by producers of cane grown by white labour is essential for the preservation of that ideal and for the purposes of national defence."

At the last meeting of the Council of Agriculture reference was made to the present position of the sugar industry, and a strong case for the renewal of the Federal Sugar Agreement was made out by the Chairman of the Administrative Committee (Mr. J. D. Story).

In the course of his remarks Mr. Story said that the continuance of the Sugar Agreement is of vital importance to Queensland and Queensland producers, and to the Commonwealth as a whole.

On Thursday, 15th June, the Council, upon the recommendation of the Sugar Standing Committee, passed the following resolution:—

> "That owing to the greater stability afforded to the sugar industry by the Sugar Agreement, this Committee recommends the Council to favour a continuance of the Agreement between the Commonwealth and the State Governments, and to undertake, through its District Councils and Local Producers' Associations and affiliated societies, to further by every means the object sought."

One of the objects of the organisation of the agricultural industry under the general direction of the Council of Agriculture was to give the producers an opportunity of taking concerted action in matters pertaining to agriculture as an industry. Seeing that the organisation of the industry had now proceeded to such an extent that 250 Local Producers' Associations had been established throughout the State, and that additional associations are being formed daily, the Council was, he submitted, of opinion that the Organisation had so far advanced as to enable it to use its weight with effect in advocacy of a question of such very great importance to the State of Queensland and to the Commonwealth as the continuance of the Sugar Agreement. He moved—"That the Council therefore resolves:—

(*a*) That the resolution regarding the continuance of the Sugar Agreement passed by the Council on the 15th June, on the recommendation of the Sugar Standing Committee, be communicated to each L.P.A.

(*b*) That a brief, concise, but impelling presentment of the sugar question be submitted to each L.P.A.

(*c*) That each L.P.A. be invited to pass at the earliest opportunity a resolution supporting the resolution passed by the Council.

(*d*) That such resolution be communicated to the Council, and, by the Council, be transmitted through the proper channels, or direct, as the case may be, to the Prime Minister, the Minister for Trade and Customs, the Queensland members of the House of Representatives and of the Senate, and to the publicity agent in Melbourne who is watching Queensland's sugar interests.

(*e*) That the foregoing resolutions be communicated to the Press."

The resolution was approved by the Council as a whole, and Mr. Story then dealt with the draft presentment of the sugar question and its importance to Queensland producers.

He said that in 1920, following decreased production, with the consequential importation of foreign sugar at a high price to meet Australia's requirements, the Commonwealth Government, in order to stabilise the sugar industry and to stimulate production, entered into an agreement with the Queensland Government to purchase the whole of the raw sugar produced in the State during the seasons 1920-21, 1921-22, and 1922-23.

Briefly, this agreement provided for:—

(1) The purchase of raw sugar at £30 6s. 8d. per ton.

(2) Equitable distribution of the £30 6s. 8d. to the producers, namely, the millowners and the canegrowers.

The Federal Government subsequently arranged with certain companies for the refining of such raw sugar and for its sale and distribution in Australia at 6d per pound, such price being necessary in order to provide funds sufficient to recoup losses incurred in respect of sugar importations.

Continuing, the speaker said that the continuance of the Sugar Agreement is of vital importance—

(1) To Queensland and Queensland producers; and

(2) To the Commonwealth as a whole.

To Queensland, because—

(1) There are 25,000 persons directly engaged in the sugar industry in Queensland, of whom 4,000 are actually canegrowers.

(2) There are approximately 100,000 persons, including the population of many of our Northern towns, who are directly and indirectly dependent on the industry.

(3) There is approximately £15,000,000 invested in connection with the Queensland sugar industry in sugar mills, tramways, plantations, refineries, and other related enterprises.

(4) The sugar industry is the most important rural industry in Queensland, both in value of production and in wages paid to those engaged in it.

(5) The fixation of an equitable price for raw sugar ensures to the canegrowers a fair price for their product, and thus stabilises the industry and provides for the employment of a large number of workers at good wages.

To the Commonwealth, because—

(1) The burden of the "White Australia" policy is practically being borne by the sugar industry of Queensland, as the settlement of our Northern littoral by producers of cane grown by white labour is essential for the preservation of that ideal and for the purposes of national defence.

(2) There is no present prospect of the establishment of any other industry on a considerable scale on the rich tropical lands in the North, and the importance of the industry as a means of settling these lands and as a source of wealth to the community cannot be overstated.

(3) Encouragement of the sugar industry by stabilisation will enable Australia to produce sugar sufficient for her own requirements and to be independent of foreign countries for her supplies.

(4) Economically, it is better for Australian consumers to pay a fair price to Australian producers than to pay a lower price to foreign countries.

The Council of Agriculture approved of the Queensland Producers' Associations strongly supporting the representations now being made to the Commonwealth Government on behalf of the canegrowers in respect to the renewal of the Federal Sugar Agreement, on the grounds stated, for a further term, and agreed to submit the question for consideration by the Local Producers' Associations.

It is suggested that if the L.P.A.'s are in accord with the objective of the canegrowers, resolutions should be passed accordingly and forwarded to the Council.

GRAPE CULTURE IN QUEENSLAND.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

Part IV.

SUMMER PRUNING.

This is described in Mr. Ross's pamphlet as follows:—

"In the case of vines that have been properly spurred back at the winter pruning—*i.e.*, each spur pruned to one, two, or more eyes according to the vigour of the canes and the variety of grapes—each bud should have put forth one or more shoots. Where more than one shoot occurs, the weakest should be rubbed off, leaving one shoot only at each node. If the vine is not a vigorous grower, one shoot may be sufficient to leave on each spur; on the other hand, where growth is rampant, two or more shoots may be allowed to proceed from the spurs. Overcrowding is to be avoided by entirely suppressing some of the intermediary shoots where the long spur or cazenave is adopted.

"It often happens that amateurs and inexperienced growers leave many more bunches on the vine than it can properly support, especially in the case of young vines of three years old, and the consequence is that the bearing period, and even the life of the vine, is shortened, or its production diminished in after years; therefore, the disbudding of fertile shoots may be equally important with that of the barren ones. The uppermost shoot, or shoots, of a spur generally absorb an undue amount of sap to the detriment of the base shoot. Such growth must be carefully watched, and, if extraordinary vigour is produced, it may be checked either by bending down the shoot or pinching out the terminal points. The side branches from these shoots, called laterals, produced from below the node where the bunch is situated, should be rubbed out; but laterals from the nodes at and above the bunch may be pinched at the first or second leaf. The lower shoot of a spur—*i.e.*, the one nearest home—should be encouraged to grow strong, as this will constitute the fruiting spur for the following year. Indiscriminate topping must be avoided. The leading shoots of the vine should be allowed to extend their growth almost to an unlimited extent, but in cases where they are outbalancing the vegetative activity of the vine, they should be stopped. It is even better to bend down the shoots than to top them too severely. The object of this method is to preserve as much well-grown foliage as possible for the accumulation of sugar and elaboration of sap for the benefit of the fruit and lignification of wood. The bunches are always better developed, more handsome in appearance, and of higher quality when ripened in the shade; but when the shade becomes too dense it is better to strip off a few of the older leaves at the base that have fulfilled their purpose than to cut away the branches."

Water-shoots—that is, new growths starting direct from old wood and not from buds of the previous year's growth—should be removed, excepting where it is necessary to provide for a new spur or rod to take the place of one that has either died out or which has outlived its usefulness. In this case the water-shoot so left should be cut hard back the following winter so as to cause it to produce good fruiting wood for the succeeding season.

Different varieties of grapes require different methods of pruning; thus the following varieties should be spur pruned to not more than two eyes, viz.:—Alicante, Aramon, Black Hamburgh, Chaouch, Chasselas

(Sweetwater), Cinsaut, Cornichon, Doradillo, Frontignan (various), Muscats (all), Royal Ascot, Trebbiano, Waltham Cross, and Wortley Hall. The following varieties, however, require to be pruned long in order to produce the best results, viz.:—Almeria (Ohanez), Black Prince, Cabernet Sauvignon, Centennial, Gros Colman, Hermitage, Sultana, and Zante Currant.

The varieties mentioned both with respect to short and long pruning are merely given as examples, as it often happens that the method adopted must be modified so as to suit the growth of individual vines, even though they are of the same variety. Thus vines which produce too much wood in comparison with their yield of fruit should be pruned longer, and those that produce a number of small bunches and comparatively little wood should be pruned more severely.

In the case of Sultanas and Zante Currants, special methods of pruning are in use in some places; but as a rule the Cazenave Cordon that has been already described gives good results.

A very large number of different varieties of grapes have been tested from time to time in Queensland, and the following list includes those that have been proved by experience to be most reliable in the following districts:—

1. *Coast of Southern and Central Queensland.*—Black Hamburgh in isolated districts, such as Pinkenba and Enoggera near Brisbane, Kolan district near Bundaberg, and Westwood near Rockhampton. Sweetwater.—In the same districts as Black Hamburgh. Muscat Hamburgh.—Enoggera, Kolan, and Westwood. Syrian.—Pinkenba and Westwood. Red Frontignan.—Rockhampton district. Chaouch.—Pinkenba. Madaline Royal.—Generally where the climate is not too humid. Wilder, Goethe, Iona Linoir, Concord, Alvey, Isabella, and Ferdinand de Lesseps.—Generally, except where the rainfall is too heavy or there is too much humidity.

2. *The Foothills of the Coast Range to the purely Coast Districts.*—All the grapes mentioned as suitable for the coast will thrive here, as well as the following:—Royal Ascot, Aramon, Cinsaut, Gros Colman, Trebbiano, and Sultana.

3. *Stanthorpe, Southern and Coastal Downs.*—All the varieties previously mentioned, as well as the following:—Alicante, Centennial, Doradilla, Gros Colman, Henab, Turki, Madrasfield Court, Mrs. Pince's Black Muscat, White Mourillon, Purple Cornichon, Black Prince, Waltham Cross, and Wortley Hall.

4. *Western Downs.*—All the varieties mentioned for the third district, as well as Gordo Blanco, Sultana, Zante, Almeria or Ohanez, Flame Coloured Tokay, and the following wine grapes:—Hermitage or Shiraz, Mataro, Grenache, Cabernet, Malbec, Roussane, Reisling, Semillon, Verdeilho, and Pedro Ximines.

Many other varieties than these mentioned can be grown, but the list I have given includes most of the sorts that have proved during the past twenty-five years to be most suitable for growing in the districts mentioned.

MARKETING THE CROP.

When grapes are grown for the fresh fruit trade, the greatest care should be taken in cutting, handling, and packing the bunches, as the price obtained will depend very largely on the condition in which the

fruit reaches its destination. It must not be bruised, and its natural bloom should be on the fruit when exposed for sale. Prior to packing, the bunches should be carefully examined and all injured, immature, or faulty berries removed. If the fruit is to be sent any distance it should not be packed until it has been gathered for some hours, in order that the stems may wilt a little, as by doing so there is less danger of berries leaving the stalks. The fruit should be quite dry, and when the stems are slightly wilted it should be so firmly packed in the case in which it is to be marketed that it will not shift during the journey. At the same time it must not be packed so firmly as to crush or injure the fruit in any way. The cases used to carry the fruit should always be lined with clean white paper, and the fruit should be graded for colour, size, and quality. It is a great mistake to market immature fruit, as there is no demand for it; and, further, it is very apt to prejudice those buyers who have been unfortunate enough to purchase it, and to put them off from making any further purchases. Grapes for wine should be fully ripe and perfectly sound. Immature grapes, over-ripe or decayed grapes, will never make a sound wine. They can, however, be made into wine fit to be put through the still for the production of alcohol to be used for fortifying other sound wines.

Hitherto very little attention has been devoted to drying grapes in this State, our local requirement for rasins, sultanas, and currants being met by the produce of the Southern States. Comparatively few kinds of grapes are grown commercially for drying, the bulk of the raisins, sultanas, and currants used in the world being grown from the White Muscat of Alexandria or Gordo Blanco, the Sultana or Thompson's Seedless, and the Zante or Corinth currant grapes. Other sorts are dried to a small extent, but the trade lines are confined to those mentioned. All these can be grown in Queensland, but before their produce is fit for drying it must be very rich in sugar; otherwise the fruit will dry light and be of poor colour and quality. This necessitates drying-grapes being grown in hot and dry districts, as it is only under such conditions that the fruit will produce a maximum sugar content in its juice and so produce a heavy, meaty, dried product. The manufacture of raisins, &c., should therefore not be attempted commercially unless the climatic conditions are favourable for the production of the right kind of fruit to dry and the right kind of weather in which to dry it.

MANURING THE VINEYARD.

If the soil is of good average fertility there is seldom any necessity to apply fertilisers during the first few years, as there is an ample supply of plant food quite sufficient for the production of strong, healthy vines capable of yielding good crops of fruit. Vines are not very severe on the soil, especially if the ashes obtained from burning the prunings are returned to it. At the same time, if the vines show signs of deterioration not due to disease or drought they will benefit materially if judiciously manured. A complete manure for vines should contain its plant food in the following proportions—viz., three parts phosphoric acid, three parts nitrogen, and five parts potash. An acre of vines in full bearing will require a manure containing 30 lb. of phosphoric acid, 30 lb. of nitrogen, and 50 lb. of potash, and these plant foods can be supplied by 2 cwt. super. or basic super., 1 cwt. sulphate of potash, and 1½ cwt. sulphate of ammonia.

Where green crop manuring is applied, the quantity of sulphate of ammonia can be materially reduced, and on granite soils containing

potash there is seldom any necessity to apply this plant food, but an application of basic super. and sulphate of ammonia or its equivalent in nitrogen in the form of green manure will be ample.

Soils deficient in lime should receive a dressing of about 1 ton of air-slacked lime or finely ground limestone every five or six years, as lime is essential to the proper development of the vine and forms an important part in the ash constituents, especially in that of the wood. Basic super. is preferable to ordinary super. in all soils that are at all sour or are in any way deficient in lime.

DISEASES OF THE VINE.

Vines are attacked by insects of many kinds, and are very subject to fungus diseases, especially in districts where the climate is more or less humid, and even in drier districts during periods of prolonged rainfall. Fungus diseases, however, do little damage when the climate is hot and dry during the growing and ripening periods. With respect to insect pests, the most serious is phylloxera, but fortunately there is, as far as I am aware, now no trace of this pest in the State, though it made its appearance here in one district some eleven years since. The steps taken for its eradication have evidently been a success, as I have neither seen nor heard of any trace of this pest since my return to Queensland in 1915, so I trust that the State is now free from it. Phylloxera vastatrix is a very minute yellow insect that lives by suction on the roots of the vine and thus saps the vigour of the plant, and eventually destroys it. It produces small galls or swellings on the roots, and the plant soon shows signs of distress, such as losing its colour and presenting a generally unhealthy appearance. Plants such as described should be carefully examined, as should this pest make its reappearance it is very likely to spread rapidly; consequently action, to be effectual, would have to be taken immediately. There is no cure for this pest other than absolute destruction. Certain varieties of grapes are able to resist its attack and are used as stocks on which to work more suspectible kinds, but none are immune. Every necessary precaution is therefore being taken to keep our State clean.

Vines are frequently attacked by nematodes which infest and destroy the roots, especially those growing near the surface. At first sight the attack of nematodes may easily be mistaken for phylloxera because, like that insect, they produce numerous small galls or swellings on the roots, but when these are examined by means of a good lens the difference is easily recognised. No minute yellow aphids are seen, and the galls when cut open show the cysts of the nematodes. In severe cases the roots are badly injured and large galls are formed. Nematodes are very difficult to destroy once the soil has become infested, but fortunately the damage they cause can be, to a very great extent, prevented by not allowing the growth of any surface roots, as the roots coming from the base of the cutting are seldom badly attacked.

Leaf-eating insects of various kinds, such as caterpillars of sorts, grasshoppers, crickets, weevils of sorts, &c., frequently injure the leaves, shoots, wood, and fruit, but the damage they do can easily be prevented by the judicious use of arsenate of lead spray, either alone or in combination with Bordeaux or Burgundy mixtures.

The larvæ of several species of borers also destroy the wood. Spraying with arsenate of lead will destroy the mature insects, but the larvæ are best destroyed by cutting out and burning the wood in which

they are harbouring. Scale insects are sometimes troublesome, but as a rule if the vines are properly treated in winter these do little damage. Should it be necessary to spray specially for these pests the spraying should be given before the scales are fully developed, when a weak oil spray will prove effectual. Mealy bugs have also given trouble the last year or two in some coast vineyards, by attacking the bunches when approaching maturity. Under normal conditions this pest is kept in check by predacious ladybirds, but when the latter are absent the best remedy is to spray the bunches with clean water applied with sufficient force to dislodge the insects, as sprays sufficiently strong to kill them would be apt to seriously damage the fruit.

ANTHRACNOSE OR BLACK SPOT OF THE VINE.

This is undoubtedly the most difficult pest the grapegrowers of this State have to contend with, as no part of the State is free from its ravages, and very few of the varieties of *Vitis vinifera* are immune to its attack. American varieties and resistant stocks are more or less immune, but unfortunately they are not of anything like the same commercial value, either for table use or winemaking, as those of the true grape or *Vitis vinifera*. Some varieties are, however, much more resistant than others, and the growth of such should be encouraged and that of highly susceptible varieties should be discouraged, as the cost of treating the latter will, in many cases, be greater than the value of the returns. The treatment of this disease is mainly a preventive one, as once it has made its appearance in a vineyard, although it may be checked, it cannot be stamped out, and where the weather conditions are favourable for its development it will frequently increase and spread in spite of all treatment.

The main object is, therefore, to endeavour to destroy all traces of the disease whilst the vine is dormant, during winter, and to follow up this winter dressing by a systematic treatment commencing when the buds begin to swell and continuing till the fruit is fully developed.

The winter treatment is given when the vines have been pruned and whilst they are still dormant. It consists, first, in gathering and burning all prunings; second, in removing all loose bark, superfluous or overgrown spurs, and carefully burning same; and, third, in painting or swabbing the whole of the vine with a concentrated solution of sulphate or iron and sulphuric acid, made by dissolving 5 lb. of sulphate of iron in a gallon of water and adding to it ½ lb. of commercial sulphuric acid.

This, in my experience, is the best winter treatment, though the use of a 10 per cent. solution of sulphuric acid, made by adding 1 lb. of sulphuric acid to 9 lb. of water, is also a very good remedy.

The object of the winter treatment is to destroy the resting spores of the fungus which are harbouring in the vine, and thus to give the young growth in spring a fair start. The winter treatment must be followed up by spraying with Bordeaux mixture—first, when the buds are swelling, and subsequently as often as necessary to protect the young growth. Bordeaux mixture is not a cure once the disease has made its appearance, though it will even then tend to check its spread; but if systematically applied in time it is a preventive, as the spores of the fungus cannot germinate on the wood, leaves, or fruit that is protected by the spray.

Where owing to weather conditions proving favourable for the spread of the fungus or from other causes the disease becomes well established, badly infested shoots should be cut off and burnt, and every care should be taken to see that the following winter's treatment is rigidly carried out.

OIDIUM OR POWDERY MILDEW OF THE VINE.

Like anthracnose, this disease is much easier to prevent than to cure once it has become firmly established; the treatment is therefore a preventive one, and consists of sulphuring the vines, as the fumes that are given off from the sulphur dusted on the vines will prevent the germination of the spores of the fungus. The first sulphuring should be given when the vines have made a few inches growth, and subsequent dressings should be given as required, the frequency or otherwise of such dressings depending on weather conditions. With dry weather there is not much chance of the fungus making a start, but with the advent of moist, muggy, or foggy weather it soon gets to work, and regular and systematic treatment is then necessary. The sulphur should be in the finest state possible, as the finer it is the better the results, and it is best applied by means of a special sulphuring machine, though should such a machine not be obtainable a sulphur bellows or even a bag of moderately open texture filled with sulphur and tied to the end of a stick and shaken over the vines will do.

Where neglected, oidium completely destroys the crop in bad cases, the berries being all stunted, discoloured, and frequently cracked, where Bordeaux mixture is being regularly used for the treatment of anthracnose, there is seldom any necessity to take special precautions for oidium, as the mixture is an effectual preventive.

DOWNY MILDEW.

Downy mildew can be prevented by systematically spraying the vines before it appears. Growers are urged to spray for their own protection. In respect to sprayings definitely provided for by the Regulation, it is questionable whether the first spraying, which is given just before the buds burst, is actually needed, but it is certainly of great value in the case of anthracnose or "black spot," which is a very serious and common fungoid disease of the vine. It is often found attacking the same plant as downy mildew, and should not be neglected. The second spraying before the vines blossom—that is, when they have grown from 10 to 18 inches—protects the new growth from infestation; and the third spraying, given when the blossom has set, protects the foliage produced after the second application.

If the weather conditions are very favourable for the development of the fungus causing downy mildew, viz., warm, moist, or foggy, it may be necessary to give an extra spraying, or even two, between the second and third sprayings. These extra applications may be made even during the blossoming period, as it is better to run the risk of losing a few berries than the loss of the whole crop. The number of sprayings necessary after the fruit has set will depend entirely on the weather. If it is warm and dry, further applications may not be necessary, but if moist and muggy, spraying must be continued, otherwise the new growth will suffer and the bunches will become affected.

The fungus that causes downy mildew is not merely a surface growth, but it extends right through the vine and is carried over from season to season by the spores that remain dormant in the old leaves during the winter and become active in the spring—probably about the end of September or early in October in the coastal districts, and a little later

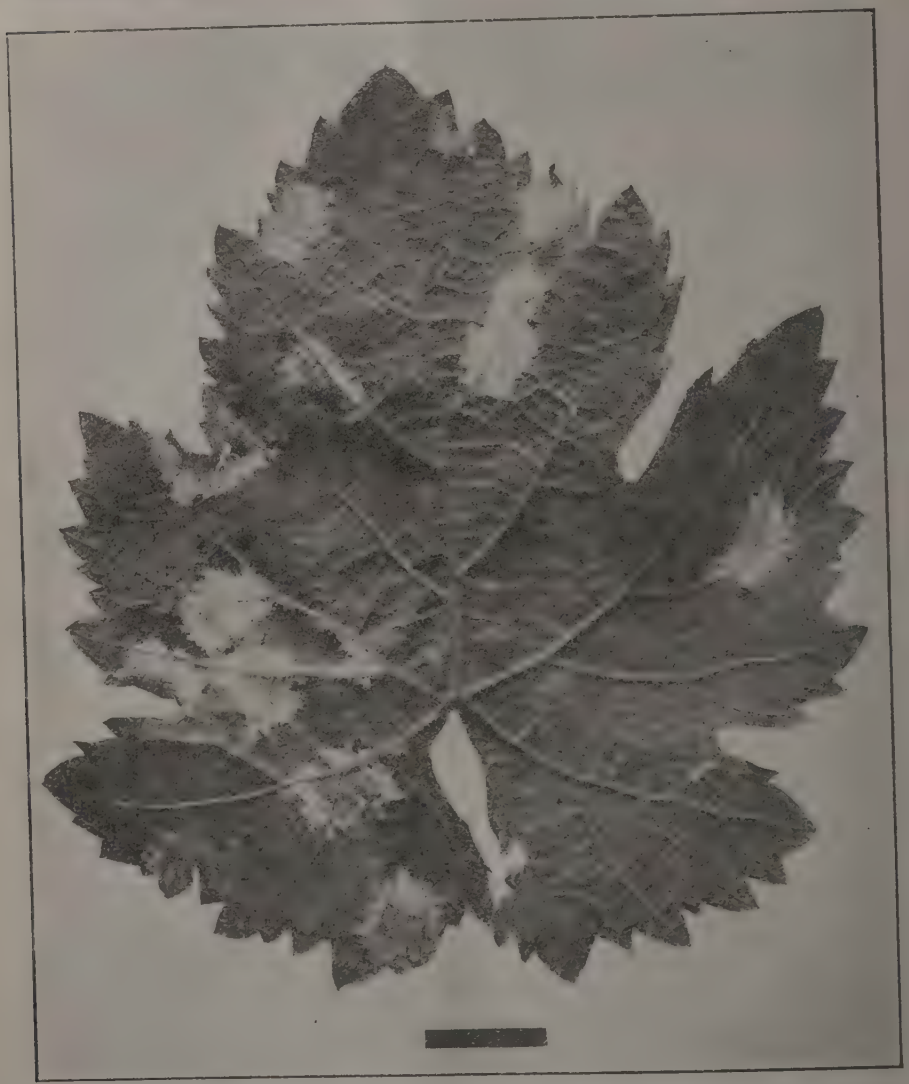


Plate 53.—Downy Mildew on Vine Leaf.

in inland regions. These spores are carried by the wind, and, if they lodge on the upper side of a moist vine leaf, they begin growth at once, provided the atmospheric conditions are favourable and the leaf has not been protected by spraying with a germ-destroying specific.

The first sign of a disease is a brownish spot on the upper surface of the leaf that looks as though a drop of oil had been deposited upon it. This is known as the "oil-spot" stage. In the course of a day or so a white downy growth appears on the under side of the leaf exactly opposite the "oil spot," and it is from this development that the disease takes its name. This downy growth produces countless spores, which are distributed broadcast by the wind. Each of these spores is capable of reproducing the disease if it comes in contact with a vine leaf under conditions favourable to its development.

When neglected, downy mildew spreads with alarming rapidity when the weather is favourable, and the entire crop of a district may be destroyed in a very short time; hence the great importance of taking precautionary measures.

The illustration herewith gives a good idea of the disease in the "downy" stage, and should enable anyone to recognise it at once. In the later stage of the disease the leaves turn brown, dry up, and fall off, the fruit is destroyed, and, in severe cases, all new wood growth is killed, so that not only is there no crop for that season but none also for the following year.

REMEDY.

The remedy for this disease is to give the leaves of the vine a protective covering before the resting spores become active in spring, and to keep them protected as long as risk to the crop exists. The best spray is Bordeaux mixture, 4-4-40; 4 lb. bluestone, 4 lb. quicklime, and 40 gals. water, made according to the directions given in departmental publications dealing with the destruction of fruit and vegetable pests. The spraying material must be neutral; that is to say, it must not contain any free sulphate of copper (bluestone), and this is determined by adding a drop of a solution of fero-cyanide of potassium to a small quantity of the mixture. If there is no discoloration, the mixture is neutral, but if there is a brown ring round the drop of ferro-cyanide, free bluestone is present and more lime must be added. If vignerons have any difficulty of obtaining ferro-cyanide of potassium, a small quantity of the solution for testing purposes can be obtained from the Agricultural Chemist.

Bordeaux Mixture (4-4-40) is prepared as follows:—

(1) Dissolve 4 lb. of bluestone in 20 gallons of cold water in one cask by placing it in a bag and suspending it in the water.

(2) Slack 4 lb. of unslacked lime in another cask slowly by first pouring about 3 pints of water over it. This will reduce the lime to a thick cream free from lumps. Water should now be added, stirring well till there are 20 gallons of milk of lime in the cask.

(3) Stir the milk of lime up well, strain it and pour the whole of the 20 gallons of milk of lime and the 20 gallons of bluestone water together slowly into a third cask; stir well for 3 minutes, and if properly made the mixture is fit for use.

The mixture is much better if made in this manner than when a strong solution of bluestone and lime is first mixed together, and water to make up the required quantity is afterwards added.

In order to see if the mixture is properly made, plunge the blade of a knife into it for a minute. If the knife is untarnished, the mixture is all right; but if the knife is stained a coppery colour, then more milk of lime must be added. This is only a rough test; and where accuracy is necessary the mixture should be tested as follows:—To a small quantity of a solution of ferro-cyanide of potassium in a test tube or small glass add a few drops of the mixture to be tested. If it turns brown, more lime is required to be added till the mixture fails to produce the brown colour. The solution of ferro-cyanide of potassium is made by dissolving 4 oz. of this substance in one pint of water. The resultant mixture is very poisonous, and should be handled with care.

The mixture should always be neutral, as if there is an excess of bluestone it is apt to injure the foliage. Use water that is free from iron, and do not make the mixture in iron, zinc, or tin vessels of any kind—wood is the best.

If desirable, a stock solution of bluestone may be kept on hand for use as required. Such a solution may be made by dissolving 100 lb. of bluestone in 50 gallons of water. Place the 100 lb. of bluestone in a bag and suspend it in the cask of water, and in the course of a couple of days the whole of the bluestone will be dissolved, and each gallon of the solution will contain 2 lb. of bluestone.

To make the 40-gallon solution you therefore take 2 gallons of the stock solution of bluestone and add 17 gallons of water to it, to make up the 20 gallons of bluestone solution for mixing with the 20 gallons of milk of lime as previously described. A stock solution of milk of lime can also be made, but it is better to make it as required.

POURRIDIE OR MOULDY ROOT.

This is a rotting of the roots, due either to the presence of a fungus such as armillaria, to unsuitable soil, or bad drainage. Liming the soil is the best remedy, but when the vines are badly diseased it is better to take them out and burn them. Sulphate of iron applied to the trunk and main roots in winter has sometimes a good effect.

SHANKING.

This term is applied to cases when the vines blossom and yet fail to set their fruit. It is not, properly speaking, a disease, but is due to physiological conditions such as sudden climatic changes, inherent weakness in the vine, failure to produce perfect flowers, &c. Certain varieties are more subject to it than others, and the following remedies are suggested:—Cincturing the shoot just below the joint where the bunch starts a few days before blossoming; or pinching the bearing shoot just prior to blossoming, or sulphuring the vine whilst in blossom. If neither of these remedies has any effect, the only thing to do is to cut the vine back and graft it with a variety that is a regular setter.

FRUIT FLY INVESTIGATIONS.

The Minister for Agriculture and Stock (Hon. W. N. Gillies) has made available the following report from Mr. Hubert Jarvis, the Entomologist in charge of Fruit Fly Investigations at Stanthorpe, dated the 27th August, and covering the period 14th July to 20th August, 1922.

WINTERING OF FRUIT FLY.

Renewed search has been made for the pupæ of the fruit fly (*B. tryoni*) in the soil under orchard trees in the following districts:—Stanthorpe, Applethorpe, Diamond Vale, Thulimba, The Summit, Cotton Vale, Beverley, and Ballandean.

In no instance were any live pupæ met with, nor were empty pupæ-cases by any means plentiful—the majority, if formerly present, having probably rotted and gone to pieces in the soil.

PUPÆ IN PACKING SHEDS.

An instance of fruit fly pupæ (two only) wintering in apples (Rhymer variety) stored in the packing-shed was brought to my notice by Mr. D. Pfunder, of Applethorpe. A search on 3rd August, 1922, in this orchardist's shed resulted in two more specimens being secured. These were found in the crevices between the flooring boards; empty pupæ cases (from which the flies had probably emerged in late autumn) were quite numerous here also.

Search in and under other packing-sheds in various parts of the district has failed so far to bring to light additional specimens of living fruit fly pupæ.

EARLIEST APPEARANCE OF FRUIT FLY.

Experiments are being conducted to ascertain the position or locality in the Granite Belt in which the fruit fly makes its earliest appearance.

DESTRUCTION OF MAGGOT-INFESTED FRUIT.

A very interesting experiment, originated and carried out at Ballandean by Mr. A. E. Watts, of that district, seems to indicate that the burying of maggot-infested fruit between two layers of fresh lime might prove an effective means of destroying the maggots of the Queensland fruit fly (*B. tryoni*).

Mr. Watts in this experiment used a large tin vessel, about 2 feet 6 inches in diameter and about the same in height. At the bottom of the vessel he first placed about 2 inches of soil, then 1 inch depth of fresh lime next the fruit (maggot-infested peaches), this three-parts filling the vessel; then again another 1-inch or 1½-inch layer of lime; and finally on top a dressing of soil.

The contents of this receptacle so charged were recently turned out in my presence, and were then examined by me for any indication of fruit fly pupæ or maggots; but a careful search failed to reveal any sign of either.

A similar method of dealing with maggot-infested fruit might be tried in the orchards, a trench being substituted for the tin vessel. The contents of this trench could, moreover, when well rotted, be used for manuring the orchard with advantage.

It would be advisable, when dealing with a large quantity of fruit in the above manner, to use more lime proportionately than the amount used by Mr. Watts in his experiment.

FRUIT FLY IN IMPORTED ORANGES.

The danger of importing fruit flies into the Granite Belt of Queensland from New South Wales, in orange and other fruits, was recently emphasised.

Mr. C. G. Williams, Government Inspector Diseases in Plants Act, submitted to this Office an orange taken from a consignment sent to Stanthorpe from the latter State. On examination fruit fly punctures were seen to be present, with eggs (hatched) *in situ*. The young maggots had, however, perished, presumably owing to their being unable to penetrate the white felty substance between the outer skin and the fruit.

Other injurious insects found also on imported fruit submitted by the above-mentioned officer for identification were red scale (*Aspidiotus aurantii*), circular black scale (*Aspidiotus ficus*) and Glovers mussel scale (*Mytilaspis gloveri*), all on citrus fruits.

Thus the value of daily inspection work now being carried out can hardly be too much stressed.

OTHER INSECTS OF ECONOMIC IMPORTANCE.

San Jose Scale (Aspidiotus perniciosus).—An instance of this destructive scale-insect occurring on hawthorn hedges in Stanthorpe was recently brought under my

notice by Inspector C. G. Williams. These hedges are growing in the Stanthorpe town area, and are very badly infested with San Jose scale. Constituting, as they do at present, a serious source of infection to adjacent orchards, they should be either effectively sprayed or destroyed.

Grasshopper Eggs (Cædicia Sp.).—Specimens of these eggs attached to wood of fruit trees have been sent to this Office from various localities in the Granite Belt. These flat oval eggs, laid symetrically in rows on the young shoots of peach and apricot trees, &c., are the ova of a green grasshopper (*Cædicia* Sp.). The eggs hatch in the spring and so give rise to numerous little grasshoppers, and these, by devouring the foliage and gnawing the young fruit, do a good deal of damage. The shoots harbouring these eggs should, when found, be snipped off and destroyed.

A small black parasitic wasp is a valuable ally in keeping this grasshopper in check, as will be seen on examination of these eggs, when numerous small round holes made in many of them by the wasps in emerging, after having completed their work of destruction, will be met with.

Scolytidid Beetle (*Xyleborus solidus* Eichf. ?).—Many plum and apricot trees that have died (probably owing to some fungus trouble, "Sour Sap," or bad drainage) exhibit in the trunk and branches small round holes each about one-sixteenth of an inch in diameter. These are thought, erroneously, by many orchardists to be the cause of the death of the host-tree.

These holes are made by a small wood-boring beetle (*Xyleborus* sp.). This little insect is not, as is often supposed, the primary cause of the host-tree dying. It, indeed, rarely makes its appearance until the tree is in a failing condition, or quite dead. It is particularly partial to apricot and plum trees, and although many specimens of their wood showing the work of this beetle have been submitted to me, I have not, as above suggested, so far found it doing any damage to healthy trees.

Cherry Wood-borer (?Maroga unipunctana, Donov. *Cryptophagidæ).*—This destructive moth-caterpillar has so far this season been rarely met with. In one instance, however, a three-year-old tree was completely rung around by its agency.

It usually makes its presence known by webbing over the injured part, covering the investing material with small particles of gnawed wood and frass (excreta). The insect is a night-feeder; one allied in habit may be found here in its native habitat boring in the wood of the honeysuckle (*Banksia* sp.). The moth is a very beautiful insect with white satiny wings; these, when expanded, measuring about 1½ inches across.

Dried Apple Beetle (*Doticus pestilans* Ollf.).—Several small dried apples were contributed by Mr. C. Warren, Thulimba, as harbouring maggots or grubs, and the latter on examination proved to be the larvæ of the dried apple beetle (*doticus pestilans—Anthribidæ*).

This little beetle is extremely partial to dried or mummified apples that have been left remaining on the trees. I have also found it in shrivelled peaches, boring into the stone in their case.

The beetle, about ⅓-inch long and brown in colour, is very active and flies readily.

It deposits its eggs on the dried apples or peaches (as the case may be) in late autumn, these eggs in due course giving rise to the grubs noticed.

I have never known this beetle to attack sound fruit.

Cup Moth (*Doratifera vulnerans—Limacodidæ*).—The cocoons of one of the cup or slug moths (*Doratifera* sp.) attached to the wood of James's seedling plum were brought to this Office by Mr. A. E. Pfunder, of Applethorpe.

The slug moth caterpillars are stout and thick-set (*i.e.* slug-like) in form, and have the extremities of the body produced into raised tubercles, each tufted with spines that come away and enter the skin when the insects are carelessly handled, causing sometimes much pain and irritation. The caterpillars devour the surface tissue of the leaves of the host-plant. This is, as far as I am aware, the first instance of a *Doratifera* larva being found in plum trees, although W. W. Froggatt and others record *Doratifera vulnerans* as attacking the foliage of the apricot. Usually, however, these peculiar caterpillars of deciduous fruit trees are to be found in the bush on various species of Eucalyptus, on whose leaves they feed, and it does not appear that the insect in question is likely to prove a pest of economic importance.

PLANT PATHOLOGY.

Several diseases of fungus origin, attacking deciduous fruit trees in the Granite Belt, have been forwarded to the Entomologist-in-Chief, Mr. Henry Tryon, who in his work is called upon to exercise a special knowledge of Plant Pathology.

One of these maladies, locally known as "Bark Canker" or "Scaly Bark," is very prevalent in the area mentioned on both pear and apple trees, and Mr. Tryon's identification of this disease and his report on the same will doubtless be of some interest to the district's orchardists. On this disease, whilst he treats of a second also, Mr. Tryon states as follows:—

Coniothecium Bark Canker.—With reference to the fruit-tree affections brought under notice in your communication of 28th ultimo and illustrated by specimens at the same time forwarded, I have to inform you as under:—

"(1) Apple.—Disease prevalent in apple, pear, and plum (and peach) wood all over district. Specimen apple from J. Sewell's orchard.

"This trouble, which is not uncommon in Stanthorpe orchards (in apple and pear), is immediately caused by a parasitic fungus *Coniothecium chromatosporum*, and may be termed Bark Blister rather than Bark Canker.

"The organism, that has dark brown myclelial threads, forms obscure dark cloudiness and spots in the dead cuticle and makes also the underlying tissue in which it thrives almost black also. These threads, again, course from cell to cell of the outer bark and replace their contents with closely packed-together short connected joints, the fungus finally producing masses of this short-jointed mycelium, whose divisions, by swelling, become spores, and on germinating eventually reproduce the organism.

"With the growth of the fungus in the outer bark the death of the latter ensues, this result being usually gradually realised. Apparently the parasite develops another phase form in which spores are produced in little receptacles known as *Phoma perithecia.*

"This disease also occurs in the pear, and on both it and the apple may do conspicuous injury by not only causing die-back, but by killing fairly large branches.

"Affected wood in which destructive changes are pronounced should be cut away and other parts treated with Bordeaux Mixture as soon as they are evidently affected, or may be in a condition to be so. Lime-sulphur should deter attack.

"Specimen No. 3 (Apple, J. Sewell).—Young wood, is an example of same disease.

"(*Note.*—That plum and peach trees are affected by the same disease is at least doubtful.)

"*Gloeospore Bark Canker—No.* 2 *Apple.*—Die-back of graft (J. Sewell's orchard.)—The specimen exhibits an old wound extending inwards to the wood within a short distance of the cut end of the stock. (It is probable that the present noticeable development of the wound has been occasioned by the invasion of the fungus at the site of its occurrence.—H.T.) As the main course of the trouble the bark towards the top end of the latter, and which has merged with that of the scion in growth, has died through the attacks of a parasitic fungus *Gloeosporium malicortis*, that is now evident in the fruiting condition. The surface of the dead bark, in fact, is densely sprinkled over with small raised pustules, showing black-points, that have erupted through them, and that contain cavities (in a fungus stroma) in which the oblong spores are packed to ooze forth, when wet conditions obtain, to spread further trouble of the kind.

"This disease also affects the fruit at an earlier season of the year, causing the condition known as "Bitter Rot," and eventually results in mummified apples that, remaining on the trees, develop further disease on the wood (through infection, say, at the site of a wound); or, falling to the ground, infect the soil that on being applied to grafted stocks may cause trouble, such as has been remarked.

"It would be interesting to ascertain to what extent this trouble is prevalent in the Granite Belt. One would like to receive additional specimens from other local sources in order that this point may be elucidated.

"The use of fungicides, as advised with respect to the former—apple disease *(Coniothecium)*—is indicated; also the observance of orchard hygiene (picking up and destroying apples showing bitter fruit rot and gathering and burning mummy fruit."

CONCLUDING REMARKS.

I am indebted to the following orchardists for specimens and material received during the month:—Mr. A. E. Sewell and Mr. D. Pfunder, Applethorpe; Mr. A. Hall and Mr. A. H. Paget, the Summit; Mr. C. Warren, Thulimbah; Mr. M. Lucas, Beverley; Mr. J. Teitzel, Broadwater; Mr. A. E. Watts, Ballandean; Mr. J. McCooker, Wyberba; and Mr. B. Watkinson, Stanthorpe.

It is, it need hardly be said, of great assistance to this Office (and, indirectly, to the Granite Belt fruitgrowing community) to receive from orchardists specimens of any insects, harmful or otherwise, that come under their notice, more particularly of those having any bearing on the fruit fly problem now being investigated.

SOME FACTS OF IMPORTANCE RELATING TO SHEEP MAGGOT FLIES.

By Professor T. HARVEY JOHNSTON, University, Brisbane.

In an article published in this Journal in June, 1921, entitled "The Sheep Maggot Fly Problem in Queensland," the present writer presented a plan of proposed or suggested research work in connection with this important matter. Earlier in the current year (March, 1922) information was made public through the pages of this Journal relating to experimental work with the various chalcid wasps known to attack blowflies in this State. In the present article it is proposed to supply particulars regarding the duration of the various stages through which blowflies must pass in order to complete their life-cycle. The observations were made in Brisbane during a period of a full year, and a more detailed account of the investigation is being published by Mr. O. W. Tiegs and the writer in the "Proceedings of the Royal Society of Queensland" (1922, pages 77-104). The data contained in that paper have been freely utilised in the preparation of this article.

Any information ascertainable regarding the life history of blowflies is of value, as it may indicate the most suitable times or places in which to apply remedial measures. It should be emphasised that the observations were made in Brisbane (carrion being used as a food material for the maggot stages) and do not necessarily hold good for conditions in typical sheep country, more especially where flies are infesting sheep.

The insects particularly studied were the two species of "hairy maggot fly," viz., *Chrysomyia albiceps* and *C. varipes;* the green bottle fly, *Lucilia sericata;* the grey flesh flies, *Sarcophaga* spp.; and the shining black blowfly, *Ophyra nigra;* while short notes are added regarding certain others, and information is supplied concerning the known range of flight of certain blowflies in the United States of America.

CHRYSOMYIA ALBICEPS.

This bluish-green fly is generally regarded as the chief sheep blowfly (the larger hairy maggot fly) and is more commonly known under the name of *Pycnosoma rufifacies*. Recent investigations have shown that it occurs commonly in India, where its larvæ live in carrion. Dr. W. S. Patton, who has devoted much time to the study of Indian blowflies, has quite recently stated that the maggots of this species are predatory, preying on and destroying the larvæ of other blowflies, amongst the eggs of which the female *albiceps* deposits her eggs. If this be the case, and provided the larvæ do not themselves cause myiasis, *i.e.*, infestation of a living animal by fly maggots, then the insect regarded as the primary sheep blowfly in Australia would really be one which is assisting in controlling those flies (whatever they may be) which actually cause the injuries. Experiments have been planned with a view to ascertaining whether the observations recorded in India hold good for Queensland also. It is, of course, possible that the "hairy maggots" feed not only on the larvæ of other carrion-frequenting flies, but also on the inflamed diseased tissues of living sheep whose injuries may primarily have been caused by one or more species of blowfly (*Lucilia*, for example).

The egg was observed to hatch in 16 or 17 hours during summer, 18 or 19 in autumn and spring, and about 21 hours during winter. The time required when eggs are laid on the wool or in injuries on living sheep would, perhaps, be a little less than 16 hours during the height of a fly season. The resulting larva feeds for 4 or 5 days (sometimes 6) when in carrion, but probably for a shorter time when infesting living animals owing to more favourable conditions of temperature and moisture. Then it ceases taking nourishment and commonly wanders during this so-called prepupal period in order to reach a suitable place where it may undergo pupation, which frequently occurs well below the surface of the ground in the neighbourhood of the spot where it finished feeding. This preparatory or prepupal stage varies in length according to temperature and humidity being shortest (1½ to 3 days) in summer, lengthening to a week or 10 days in winter. Hence the total time passed in the larval stages varies from 5½ to 8 days in summer to as much as 15 days in winter. The larva now become a pupa, from which after a period of 3 to 8 days in spring, summer, and early autumn, and 10 to 20 days during the rest of the year (say, May to September), the adult fly emerges, leaving an empty pupa-case or puparium behind. If we add together the length of these various periods (egg, larval, prepupal, and pupal), we ascertain the length of time which elapses between the deposition of the eggs by a female fly and the emergence of the flies which have ultimately developed from such eggs. This period was found to be shortest during February, our minimal observation being between 9 and 10 days, which agrees with what Dr. Illingworth reported as having noticed during midsummer in Hawaii. The time noted as being

required in Brisbane varied from 9 to 14 days in midsummer (December to March), lengthening in spring and autumn to from 13 to 17 days and in winter to a period of from 3 to 5 weeks. E. Jarvis indicated that 11 days were needed in Longreach in October, with an average mean temperature of 75.5 degrees Fahrenheit, the combined egg and larval stages requiring 7 days and the pupal stage 4. We found that in Brisbane during the dry month of October 13 days were needed for these periods. Mr. Froggatt reported that less than a fortnight was required in New South Wales (presumably during summer).

The writer ventures to express the opinion that, when bred in living sheep, the period between egg-deposition and fly-emergence in Queensland sheep country will probably be between 9 days and a fortnight, except during the dry season, when the pupal stage will be prolonged for an additional 7 to 14 days, as it will be subject to atmospheric and ground conditions, so that the full period may then be between a fortnight and a month. The very rapid increase in the number of flies soon after rain is almost certainly mainly due to the influence of moisture on the pupæ, which then rapidly complete their metamorphosis, and emergence occurs; hence abundance of flies soon make an appearance.

We cannot give definite information as to the length of time required to elapse after emergence before these flies begin to lay eggs, though 5 or 6 days seem to be needed. If these figures be correct, then during the hot moist midsummer months one may expect a new generation of flies in from 14 to 21 days. In other words, the short period of from 2 to 3 weeks would be sufficient to allow the laying of eggs by a mother fly and egg deposition by her daughter which developed from such eggs.

We do not know how many batches of eggs, nor how many eggs in each batch are laid; nor do we know how long the adult fly may live under natural conditions, but it was ascertained that when bred in captivity in Brisbane they could live for at least 30 days, though 15 to 26 days represented the more usual period. Flies generally live a shorter time during warm weather when their activity is greatest, but in our observations no marked difference was noted in regard to this particular species.

CHRYSOMYIA VARIPES.

The small greenish blowfly whose larva is the lesser hairy maggot is more commonly known in this State as *Pycnosoma varipes*. It frequents carrion. Its eggs require from 17 to 19 hours to hatch (October to April). The larva, whose habits are similar to those of the preceding species, feeds for a period ranging from less than 3 days to 5 days, the shortest periods being during January and February, and 4 to 5 days during the remainder of the year. Then follows a prepupal period of one to two days in summer, lengthening to a week or more in winter, so that the total time occupied by the larval stages ranges from 4 to 7 days in summer and upwards to 13 during winter. The succeeding pupal condition requires from 2 to 5 days (usually 4) in suitable situations in summer, and as much as 1 to 3 months in winter. Thus the combined egg, larval, prepupal, and pupal stages—*i.e.*, the time from egg-deposition to the emergence of the fly—may be as short as 8 days in February (8 to 14 days in summer), lengthening to 2, 3 or even 5 weeks, as the temperature and humidity fall.

As in the case of *C. albiceps*, we do not know what period elapses before the emerging fly can lay eggs, nor how many batches are laid. It was ascertained that in captivity the adult fly could live from 19 to 20 days throughout the year, a period similar to that recorded above for the related fly. It should be mentioned that, as far as was observed, there was no attempt at pairing in either case during captivity.

LUCILIA SERICATA.

The "green bottle" flies, which are readily attracted to carrion and house refuse in our Australian cities, are generally regarded as belonging to the above-named species. Amongst the other species of this genus known to occur in Queensland there might be mentioned *L. solaia* and *L. fuscina*. *L. cæsar* has been reported from New South Wales. We find that at least two species are common in Brisbane. The name *L. sericata* is provisionally accepted as designating the commonest species met with locally, and the following data relate to it:—

Eggs hatch in from 16 to 18 hours during summer, but rather longer (up to 24 hours) when conditions are either drier or colder. The larva, when bred in carrion, feeds for 4 or 5 days, sometimes 6, then wanders away, and after a lapse of from 2 to 5 days more (excepting during winter, when as much as 3 weeks may elapse) it passes into the pupal condition, in which it remains for from 6 to 8 days (ranging to 17 in winter). The fly, then, emerges in from 12 to 16 days, usually 13, from the time that the egg was laid, except during winter, when as long as 4 weeks may be needed.

From 6 to 10 days after emergence, pairing occurs and eggs are laid two days afterwards. It will be seen from these data that it is possible for a complete generation to be passed through in about 20 days under midsummer conditions in Brisbane, but judging from the findings of Bishopp and Laake, who reported that egg-laying may take place in Texas, U.S.A., in from 4 to 21 days after emergence, it is likely that the minimum period in Brisbane may be 3 or 4 days less than that observed by us; in other words, in 16 or 17 days.

Specimens bred and maintained by us in captivity lived from 12 to 36 days in summer, as well as in winter. Froggatt observed that during midsummer in N.S.W. 12 or 13 days were required between egg-deposition and fly-emergence, his observation agreeing with our own in regard to Brisbane summer. Similar periods were registered during summer in Texas, U.S.A., but it was found that in winter these became greatly lengthened and from 4 to 6 months were needed, owing to the colder winter climate. A similar result would no doubt be obtained under similar climatic conditions in Australia, the winter being passed through by means of prolonged larval and pupal stages.

LUCILIA CAESAR.

Lucilia caesar, which is reported to occur in this continent, has been found to be able to pass through its stages from the egg to the emerging fly in from 9 to 21 days during warm weather in Eastern Texas, U.S.A., and from 16 to 60 (generally 24) days in San Francisco, and to commence egg-laying in from 5 to 9 days after emergence, so that a complete generation may be passed through in a climate which more or less resembles that of Sydney in 15 or 16 days. No doubt, in Brisbane, if the fly occurs here, the required time would be probably less. The similarity in regard to the minimal time for these two species, *L. caesar* and *L. sericata* is noteworthy.

OTHER COMMON BLOWFLIES.

Calliphora augur (*C. occaniae*).—This is the smaller of the two common blowflies met with, even in houses, especially during winter and spring in Brisbane. It may be recognised by the greenish-blue colouration of the upper part of the abdomen. It may either deposit maggots or lay eggs. In the latter case hatching may occur in a few minutes or may take as long as 6 hours, perhaps longer. The larvæ feed for 4 or 5 days; then follows a prepupal stage of 4 to 8 days, succeeded by a pupal stage of from 10 to 19 days, so that the length of time elapsing between the deposition of an egg or a larva and the emergence of the blowfly is about 18 to 20 days, but may extend to as much as 33 during winter in Brisbane. Froggatt reported that in N.S.W. during summer 14 to 18 days were needed, while in winter a period of from 6 weeks to 2 or 3 months was required.

Neopollenia stygia (*C. villosa*).—This is the rather large blowfly, dark-greyish in general appearance, but with a distinct golden colour on the lower surface of the abdomen. It is common in the vicinity of houses and will readily enter. Eggs are laid, but no details are available regarding the length of time required by the fly to pass through its different stages, though Mr. Froggatt ascertained that a fortnight was the average time needed in summer in N.S.W. from egg-laying to emergence.

Sarcophaga spp.—The flesh flies, which somewhat resemble overgrown house flies, differ in having on the thorax three instead of four dark stripes, and these are separated by grey, silvery, or golden colouration. We have ascertained that in Brisbane the larvæ feed during summer for from 3 to 6 days and for a week in winter. Then follows a prepupal stage of 2 or 3 days (7 to 9 or more in winter) and a pupal of from 5 to 9 days in summer, lengthening greatly during winter, as long as 16 weeks having been required in one of our experiments. The total time which elapses between the deposition of maggots by the parent and the emergence of the resulting fly is between 12 and 18 days in summer, but lengthening to many weeks and even to several months during winter, on account of the extension of the pupal period. In about 11 days after emergence flies begin to larviposit, so that during summer a new generation, *i.e.*, from the birth of the mother to the birth of the first offspring, may be produced in 3 to 4 weeks.

Ophyra nigra.—The rather small, shining, black blowfly which bears this name very commonly visits carrion in Eastern Australia. In Brisbane its eggs hatch in about a day, larvæ feed for 5 or 6 days, and then there follows a prepupal stage of from 7 to 11 days in summer, lengthening to 3 or 4 weeks during winter. The pupal condition is passed through in about a week in summer, but 2 or 3 weeks are needed in winter. Thus the time required for full development from the egg to the newly-emerged fly is about 3 weeks in summer, 4 weeks in autumn and spring, and as much as 10 weeks may be needed in winter. In from 5 to 7 days after emergence egg-laying begins, so that a complete generation is passed through during summer in Brisbane in from 24 to 37 days. Adults were found to live from 3 to 4 weeks in captivity after emergence.

Related to the two blowflies first treated of in this article is the well-known American screw-worm fly, *Chrysomyia macellaria*, which readily attacks and deposits its eggs in domesticated animals as well as man, besides ovipositing in carrion. It passes through its combined egg and larval stages much more rapidly when infesting live cattle or sheep (4 to 5 days) than when in carrion (6 to 20 days). Then the maggots leave their food material and make their way below the soil to pupate, just as the majority of Australian sheep maggot flies do at this stage. After a pupal stage of from 3 to 14 days the flies emerge, and are capable of laying eggs in from 3 to 18 days. Consequently the whole life cycle from the egg to the emerging adult can be completed in a little more than a week under optimum conditions of temperature and humidity, such as obtain when the eggs and larvæ develop in living animals, while from flies so bred the period elapsing between egg-laying by a parent and egg-laying by the progeny of such eggs may be as short as 10 days. Bishopp stated that eight consecutive egg-depositions by one fly had been observed, the intervals being from 1 to 7 days; that under most suitable conditions batches were laid at intervals of 2 to 4 days; that the number of eggs laid in each batch varied from 40 to 248; that the greatest number recorded as laid by one fly was 1,228; and that there appeared to be from 10 to 14 broods each season in Southern Texas.

It would be of interest to possess accurate data regarding the length of the life-cycle of the Australian sheep maggot flies, when developing in or on living animals. In the light of our present knowledge effective treatment of blown sheep once a week would be sufficient if the medicament applied were such that its larvicidal action soon disappeared. This would probably be an expensive proceeding. It has been claimed that certain arsenic-containing mixtures now utilised remain effective for a considerable time, and that they not only destroy any larvæ present when the solution is applied but the poisonous action is exerted against the larvæ as they emerge from such eggs as may be laid subsequently on the poisoned wool.

FLIGHT OF BLOWFLIES.

Two matters of importance in connection with any serious attempt to control flies, whether they be house flies in a town or blowflies in fly-infested sheep districts, are a knowledge, firstly, of their favourite breeding-places and secondly, of the distance which such flies can travel whether with the wind, across it, or against it. We know that blowflies breed chiefly in carrion and various forms of refuse containing animal matter; consequently prompt destruction of all such material would bring about the control of blowfly infestation.

When dealing with the American screw-worm fly, Bishopp stated in 1915 that, after careful estimation, he considered that the carcass of one cow might produce upwards of a million of these flies. One may safely assume that a dead sheep can provide sufficient food to rear some thousands of blowflies under Australian conditions, especially if the atmosphere be warm and moist. It is of importance, then, to know the maximum range of flight of such insects. No information has been published regarding experimental work to determine the distances in Australia. Consequently, one can only draw attention to results obtained elsewhere.

Bishopp and Laake, using a series of traps arranged at varying distances approximately north, east, south, and west from a centre in a town in Eastern Texas, U.S.A., reported that suitably marked blowflies were recovered at the following maximum distances from the point of release:—*Chrysomyia macellaria* (screw-worm fly) 15.1 miles, *Phormia* 10.9 miles, *Lucilia sericata* 1.2 miles, *L. cæsar* 3.5 miles, *Synthesiomyia brasiliana* ½-mile, *Sarcophaga* spp. 3 miles, *Ophyra* sp. 7 miles. The first-named is related to the Australian hairy-maggot flies which infest sheep, the third, fourth, and fifth species occur in Australia, as do species of the last-named two genera. We may then safely assume that Australian blowflies can fly for many miles from the place where emergence takes place. American observations showed that such dispersion occurred in all directions, and that though the chief stimuli inducing such dispersion seemed to be the desire for food and the desire for suitable breeding places, yet there was also a strong migratory instinct independent of these, especially in the case of *Chrysomyia*. Widespread dispersion might be readily effected as many specimens of the last named were caught in traps 8 miles distant in all directions from the point of release in less than 24 hours afterwards, and 10 miles in less than 48 hours. Even the house fly was found to be able to travel more than 6 miles in less than 24 hours, and the maximum distance from the point of release at which the species was collected was a little over 13 miles, while numerous specimens were recaptured at very considerable distances away, even when the position of the trap in which they were caught necessitated flight in some cases across the wind and in others against it. Marked flies were recaptured by these authors as late as 17 days after release in the case of *Chrysomyia*, 15 days in the case of the house fly, 6 to 8 days for *Ophyra*, and 11 to 12 days for *Sarcophaga*.

From the results of these carefully planned experiments one can readily understand the possibility of the flock of a sheep owner who assiduously destroys all

carcasses and other fly-breeding material on his property becoming attacked by maggot-flies which have been bred from carrion many miles away. These facts should emphasise the need for continuous and concerted action by pastoralists against the breeding places of such flies. The writer does not desire to belittle in any way the excellent work being done in Queensland in connection with the treatment of sheep by dipping, jetting, spraying, &c., with some arsenical solution to protect them against fly infestation, but none of these methods attacks the root of the trouble. The poison applied no doubt destroys great numbers of flies while they are still in their early developmental stages (egg and larva), but the effect when compared with the enormous numbers of the pest can be but slight. One must not forget the extremely important part which climate plays in controlling or in increasing the blowfly population in any particular district. Climate may render the breeding material suitable or unsuitable, and besides it greatly influences the duration of the various stages through which flies must pass.

In this article no reference is made to utilisation of natural enemies of blowflies, such as the various parasitic wasps, since that aspect was dealt with by the writer in an article which appeared in this journal some months ago.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of August in the Agricultural Districts, together with Total Rainfalls during August 1922 and 1921 for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of Years' Records.	Aug., 1922.	Aug., 1921.		Aug.	No. of Years' Records.	Aug., 1922	Aug., 1921.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	0·89	21	0·13	0·92					
Cairns	1·81	40	0·54	1·44	Nambour	2·04	26	0·77	1·63
Cardwell	1·34	50	0·18	1·38	Nanango	1·47	40	0·58	0·45
Cooktown	1·39	46	0·24	0·97	Rockhampton ...	1·07	35	0·73	2·66
Herberton	0·70	35	0·12	0·61	Woodford	1·90	35	0·58	1·07
Ingham	1·44	30	0·10	1·82					
Innisfail	5·37	41	1·53	3·74					
Mossman	1·36	14	...	0·79					
Townsville	0·48	51	Nil	0·16	*Darling Downs.*				
					Dalby	1·26	52	0·36	0·37
					Emu Vale... ...	1·23	26	0·46	0·36
Central Coast.					Jimbour	1·33	34	0·35	0·94
					Miles	1·25	37	Nil	0·60
Ayr	0·56	35	Nil	0·41	Stanthorpe ...	1·88	49	0·54	0·18
Bowen	0·72	51	Nil	0·35	Toowoomba ...	1·79	50	0·49	0·84
Charters Towers ...	0·54	40	Nil	0·64	Warwick	1·57	57	0·50	0·50
Mackay	1·08	51	0·02	0·91					
Proserpine	1·43	19	Nil	3·73					
St. Lawrence ...	0·93	51	Nil	0·62	*Maranoa.*				
					Roma	0·98	48	Nil	0·83
South Coast.									
Biggenden	1·23	23	0·49	1·59					
Bundaberg	1·40	39	1·10	0·85	*State Farms, &c.*				
Brisbane	2·14	71	0·16	0·41					
Childers	1·30	27	2·03	1·45	Bungeworgorai ...	1·00	8	Nil	0 69
Crohamhurst ...	2·32	30	1·18	1·45	Gatton College ...	1·25	23	0·21	0·22
Esk	1·62	35	0·52	0·54	Gindie	0·82	23	Nil	1·05
Gayndah	1·26	51	0·51	0·59	Hermitage ...	1·46	16	0·49	0·27
Gympie	1·88	52	0·15	1·30	Kairi	1·20	8	0·18	1·25
Glasshouse M'tains	1·66	14	0·87	1·45	Sugar Experiment				
Kilkivan	1·60	43	0·71	1·05	Station, Mackay	0·99	25	0·05	0·64
Maryborough ...	1·79	51	0·45	1·02	Warren	1·16	8	...	1·31

Note.—The averages have been compiled from official data during the periods indicated; but the totals for August this year, and for the same period of 1921, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

CANE PEST COMBAT AND CONTROL.

The Entomologist to the Sugar Bureau at Meringa, near Cairns (Mr. E. Jarvis), reports as follows for August, 1922.

CANE PESTS ON THE HERBERT RIVER.

A special visit of inquiry was paid to this district towards the middle of this month, with the object of reporting on various cane affections.

Rats and Gumming Disease appear to be doing most damage, but considerable injury is being caused also by cane-grubs and borers. Owing to co-operation on the part of the managers of the Victoria and Macknade mills I was enabled to get over the ground quickly, and so make the most of the limited time available. Interesting evidence bearing on the subject in question was obtained from the secretaries of the Herbert River and Macknade Farmers' Associations, and from Mr. Stephenson, of the Macknade mill, whose cordial assistance was much appreciated. Much of the information gathered will be found embodied in the following notes.

INJURY BY RATS.

This pest, which appears to be most plentiful on the Victoria mill side of the river, is said to be responsible for injuries second only, if not equal, to those caused by gumming disease, the loss from rats last year in the Victoria mill area being estimated, Mr. Thornton tells me, at £30,000 sterling. The rats breed mostly in swampy lands and creek beds, being most numerous on selections adjoining such places, more especially where the headlands are narrow in width and allowed to get very weedy. Unfortunately, they attack by preference the softer varieties containing most sugar, and by gnawing deeply into the basal portion of sticks will sometimes, when feeding among a heavy crop, bring to the ground in a single night scattered areas of cane of considerable extent. An offensive campaign has been started by the C.S.R. Company, under the superintendence of Mr. Stephenson, the plan of procedure being to distribute poison-baits manufactured by the Company to a number of controllers in the various rat-infested districts. These are supplied with a list of growers to receive the poison, and in the Macknade area a man acting under the controller's direction goes from farm to farm, systematically, laying the baits. Although supplied free of cost, many growers will not take the trouble to do the work themselves, unless their cane happens to be severely attacked. Many different poisons are being tried, but phosphorous bait is thought to have given the best result so far. To prepare a good bait of this description, dissolve 2 oz. of phosphorous in 50 oz. of boiling water; stir in slowly 40 oz. of flour, and when the mixture is almost cold add, while still tepid, 40 oz. molten tallow and 20 oz. sugar. Definite evidence with regard to the effect of these poisons is not always forthcoming, dead rats being seldom found, but I believe good work is being done, although we cannot expect to see any very decided results within a few months after application.

Control Methods.—Briefly, these should consist in such commonsense methods as—(1) leaving wide headlands and keeping them clean; (2) poisoning the rats, especially on infested blocks when nearly cut out, and during November and December, when rats are forced to congregate on smaller areas of uncut cane; and (3) cleaning up breeding haunts, when possible, in the immediate vicinity of plantations.

Experimentation with poisonous compositions should be continued with a view to the discovery of a more deadly, yet palatable, bait than those being tried at present. In this phase of the work we shall be pleased to co-operate with the C.S.R. Company.

GUMMING DISEASE.

This well-known bacterial disease is prevalent, Mr. Stephenson tells me, throughout the Herbert River district, occurring for the most part in Clark's Seedling (H.Q. 426). As this cane matures in about 11 months, is rich in sugar, and generally yields a heavy crop, it is naturally a favourite, and is grown here more than any other variety. A map of the gummed area is being prepared, and this should furnish interesting data regarding the porosity, drainage, &c., of the various soils affected. Good crops of gummed cane can be obtained, providing the trouble does not start during early growth. Unfortunately, however, the Badila is already affected, and it is feared may become more so as time goes on, unless Clark's Seedling can be quickly replaced by some variety less susceptible to the disease.

The variety H.Q. 409, although practically immune from gumming, is unpopular here because of its slow growth and tendency to arrow freely and very early. It appears, however, to be a heavy bearer, as from twenty-five to thirty sticks are often obtained from sets that have been planted 18 inches apart. Mr. Geeson tells me that he has grown as many as fifty-seven canes in a single stool of this variety.

Remedial Measures.—It is generally admitted that the chief factors responsible for the occurrence of gumming disease (*Bacillus vascularum*) are:—(1) Poor drainage; (2) an impervious subsoil within 2 or 3 feet from the surface; (3) defective cultural methods; and (4) an abundant rainfall. Topographical conditions, the physical nature of the land, and general texture of the soil, are supposed to exert no influence on its development.

According to Professor Cobb, this one condition of drainage has a most important bearing on the prevalence of gumming disease, and he recommends a rotation of crops, where possible, on land that has been long under susceptible varieties of cane.

A good instance of the benefit to be derived from proper drainage was brought under my notice at Halifax. The farm in question comprises about 60 acres situated on the river bank, and divided by a road into two equal portions. On one of these, which adjoins the river, good crops have always been obtained, while the cane on the other portion, bounded on the far side by a swamp, has invariably either failed or been scarcely worth cutting. Three different selectors were unable to do anything with this latter portion, but the present owner has succeeded in raising a fine crop of cane uniform in height throughout. This was effected simply by cutting a few deep main drains through the block emptying on to the swampy land, and running cross drains into them. The improvement of canes by selection, and the planting of immune or but slightly susceptible varieties is, of course, advisable, and I understand that the Company have this matter in hand. Less volunteering and the use of green manures would probably also tend to reduce the chances of gumming.

Little or no attention is being given to the selection of clean cane for planting, it being the practice on some selections to place whole sticks in the drills, and before covering chop them through here and there as they lie in the soil. Needless to say, such lax methods of planting are very unsatisfactory from an economic standpoint, a s borers, gumming, or other diseases would thus escape notice altogether and have a good chance of spreading to clean areas. This factor is of primary importance, since it will be of no avail to thoroughly work and drain the soil unless clean sets are afterwards planted. Burning the trash has been recommended, as this gets rid of countless numbers of bacteria, spores of fungi, beetle borers, &c.

PEST DESTRUCTION FUND.

Grubs have been very troublesome in places. Collecting the beetles was discontinued at Cordelia about five years ago, with the result that during 1920 considerable losses were experienced, these becoming worse the following year (1921). During the present season, the damage in this district has been very severe, and I understand that collecting at Cordelia will be taken up again. At Macknade and Ripple Creek the growers pay so much per acre (up to 150 acres only) into the fund, the amount varying from 1s. 6d. to 2s. This method of payment is considered to be better than that of fixing the amount at so much per ton of cane. Naturally, the aim of both small and big farmers would be to produce as much cane as possible per acre, and so decrease the amount of the levy; thus a 24-ton crop at 2s. per acre would cost one penny per ton to protect from grubs, whilst a 36-ton crop at the same rate would mean a reduction to three-farthings per ton, and so on. In order to achieve this result, better methods of drainage, cultivation, seed selection, &c., would have to be adopted, meaning not only heavier crops but also mimimum losses from gumming, grubs, and other diseases.

Beetles are paid for by the quart; 1s. for greybacks and 2s. for golden beetles. Last season, at Ripple Creek, 8,367 quarts were collected, costing £418 7s.; and at Macknade £280 5s. 9d. was paid for 5,618 quarts. Receivers get 5 per cent. of the cost of all beetles handled. Growers here are not slow to recognise the value of this controlling factor, since at Ripple Creek last year only two farmers objected to contribute to the fund, and at Macknade every grower subscribed to it. Beetles are caught during the first three weeks following emergence, and collecting commences directly they appear on the wing. In a general way grubs will attack most varieties of cane, but the stronger-rooting kinds are most resistant, as they do not go over so easily. Mr. Geeson planted a patch of Black Innis and Badila side by side, and found that the latter was badly attacked, while the Black Innis was not appreciably injured.

PARASITE OF BEETLE BORER.

The cane borer (*Rhabdocnemis obscurus* Boisd.) appears to be spreading on the Herbert River, although occurring at present mostly in the basal portions of canes. Rat-eaten sticks are very liable to become infested, as the beetles oviposit by preference in soft places where the rind has been gnawed off by rats.

The C.S.R. Company have established a breeding-cage at Macknade for rearing tachinid fly parasites, and I made arrangements with the Secretary of Macknade Farmers' Association to collaborate with them in this useful work, if necessary, in order that the parasites might have a better chance of spreading throughout the district with as little delay as possible. Mr. Stephenson is in control of the cage at Macknade, and has already bred and liberated a number of flies. In this connection it may be mentioned that tachinid parasites are at present emerging freely in our breeding-cages at Meringa Laboratory, and on the 25th instant 60 specimens (mostly females) were liberated by us among bored cane at South Johnstone, and three days later another lot of 25 were let go at Aloomba.

WHITE ANTS ATTACKING SUGAR-CANE.

Destruction of cane sets at Gordonvale by two species of white ants (*Termes meridionalis*, and *Eutermes fumigatus*) was first recorded by the writer in Bulletin No. 3 of this Office. The damage, however, occurred mostly in ground brought under cultivation for the first time, and is of minor economic importance. In such cases the presence of this pest is doubtless due to affected roots of big trees having been left ungrubbed.

I was much interested to learn from Mr. Geeson that a small species of termite is known to attack cane sets planted in well-worked land at Macknade. In one instance patches of cane affected in this way were found to be distributed over a field that had been under cultivation for the past thirty years.

THE BANANA BEETLE BORER.—III.

By JOHN L. FROGGATT, B.Sc.

Mr. Froggatt's first progress report appeared in the September issue, 1921 (vol. xvi., pp. 200-208). A second progress report was published in the May Journal, 1922 (vol. xvii., p. 240). The observations and conclusions embodied in the following report cover the period from January to July, 1922, inclusive.

The importance of the Banana Beetle Borer problem in its relation to the continued welfare of the banana-growing industry of Queensland is gradually becoming recognised, with the result that our knowledge of the distribution of the pest has been considerably augmented during the last six months. It is still, however, far from complete, and so long as our knowledge remains in this state the work of controlling or even checking the pest will be severely handicapped. We can definitely state that certain areas are infested by beetle borer, but it is extremely problematical whether we can say that even some of the other areas are free from this pest.

During the last six months banana beetle borer infestation has been found to be bad in three districts, slight in a fourth, and suspected in a fifth district from which it had not been previously recorded. It is too big an undertaking under existing conditions for even a small body of men, and still more so for individuals, to thoroughly examine every banana plantation in the State within a reasonable time in order to determine the presence or absence of banana beetle borer therein. The greatest difficulty is met with to induce a grower to admit that he has an infested plantation: rather is the short-sighted policy of "hush it up" preferred. The pest has to be coped with, and the sooner the better. It therefore behoves growers and their associations to assist the investigations by co-operating, rather than hampering them by standing aloof. Great assistance has been rendered by some growers, and their co-operation has been of great service and greatly appreciated.

THE EGG.

Further observations prove that the site for the deposition of the egg most generally favoured in standing plants is just about ground-level, the egg lying just underneath the surface of the plant. A few instances have been noted in which the eggs had been laid below the surface of the soil, more particularly in the suckers. In stems and corms lying on the ground the eggs were almost invariably laid on the underside.

Laboratory observations showed oviposition to be active up to the beginning of June, being highest in March, remaining high in April, and decreasing in May. With the advent of cold weather the number of eggs deposited decreased most markedly. Information obtained in the field corroborated these observations.

These data support the hypothesis that extremes of heat and cold decrease egg-development in a similar manner.

Photo : Dept. Agriculture and Stock.]

PLATE 54.—BUTT OF BANANA PLANT

Showing effect of infestation by *C. sordidus*. Scale, 2 centimetres (2 cent. = 1 inch). Note—(1) tunnelling in outer part of corm ; (2) plant decay spreading from grub tunnels in centre of corm ; (3) destruction of central core of plant by grubs.

Oviposition, though existent throughout the life of the female beetle, is more active in the early stages than in the later ones of this. In no case were two or more eggs found in the one cavity.

The totals of egg counts from the imagos under observation (*see* Table D) are given in Table A. When comparing the number deposited with the number of beetles in each lot, it must not be forgotten that only a portion of the beetles were females. It is then obvious that a few beetles in a plantation will very rapidly increase to sufficiently large numbers as to cause appreciable damage.

All the observations tend to prove that the development of eggs in the ovaries of the females is not divided into periods for the production of one batch at a time, but that the process is continuous, the individual eggs being deposited as they are developed.

The period passed in this stage of the life cycle has shown wide variations under different climatic conditions. The minimum period noted was four to five days, with eggs laid between 25th January, 1922, and 1st February, 1922. Those laid up to 28th April, 1922, matured in an average of eight to nine days. Eggs deposited in the latter end of May, 1922, showed a marked increase to 27-31 days for the developmental period, while those laid early in July took 34 days to mature. Progressive average results are given in Table B.

LARVA AND PUPA.

As the larva (or grub) approaches maturity, it tunnels towards the outer margin of the bulb and comes to rest just underneath the surface. Before changing into the pupa (or chrysalis) it lies dormant for a time, exhibiting but little powers of movement if disturbed. The body becomes flaccid and elongated, losing the typical shape of the larva of this species.

Since it has not always been possible to ascertain the periods passed in the larval and pupal stages separately, these have been combined in the calculations. With eggs laid in March, 1922, the larval and pupal periods occupied an average of 34 to 46 days (min. 26; max. 48), and with those laid in April, 1922, these combined periods increased to an average of 68-76 days (min. 67; max. 78).

In the plant in the stool a considerable amount of the tunnelling by the grubs is done in the peripheral portion of the bulb. It is during this time that the greatest amount of harm is caused to the plant, because many root origins are damaged, if not destroyed, by the larva in its passage through the corm, not only then causing loss of sustenance to the plant, but also indirectly depriving it of sufficient support in the soil on account of the damaged and destroyed root origins leading to decay of these organs in their entirety. Decay of the plant tissue often follows, and spreads out from the grub tunnels, thus causing still further destruction of the bulb of the plant.

In stems the principal part traversed by the larvæ is the central core.

Pupæ were found in corms in the field on 30th July, 1922.

THE IMAGO (OR BEETLE).

There is no doubt that the beetle moves beneath the surface of the ground, even by day, but it has the strongest abhorence of light, this being more marked with bright than with dull lights.

Although no positive proof has yet been established of the powers of flight of the beetle, it is possible that they exercise this power of migration only at a certain time of year.

During the colder portion of the year the beetles are particularly sluggish. In July, 1922, a large number of imagos was found in old larval tunnels in the corm of standing plants, where they were apparently sheltering; in every case an opening on to the surface of the bulb was present, communicating with the larval tunnels, and a greater number was present in these situations than could have bred in the bulbs, as shown by the amount of tunnelling.

Beetles have been found clinging to the bottom of plants standing in the stools, showing that in these situations, at any rate, they will burrow several inches below ground level.

Beetles, emerging from pupæ between 16th and 20th April, 1922, deposited fertile eggs between 26th and 29th May, 1922, giving a period of 36 to 43 days from emergence to mating and oviposition. These imagos were bred from eggs deposited between 1st and 13th March, 1922, thus giving the period from oviposition to oviposition by the beetles bred-out as 72 to 92 days.

In the case of eggs laid between 8th February, 1922, and 13th March, 1922, the full life cycle (deposition of egg to emergence of beetle) averaged 42.5 days to 51.25 days, and with those laid between 10th and 18th April, 1922, the cycle occupied an average of 78 to 83 days.

Photo : Dept. Agriculture and Stock.]

Plate 55.—Infested Banana Sucker, showing appearance of Plant.

Photo : Dept. Agriculture and Stock.]

Plate 56.—Infested Banana Sucker, showing appearance of Plant and Grub Tunnels in Corm.

Continued observations on the length of life of the beetles show that it is a very long one. In the series under observation, twelve lots have died out, yielding rather remarkable results. The imagos in five of these lots were collected in the field, and those in the other seven lots were bred between November, 1921, and January, 1922, from eggs laid in the office. Those collected in the field gave an average maximum length of life of 412.2 days to 420.2 days, while those bred out had an average maximum of 170 to 183.8 days. The longest life was shown in Lot B, 448 to 453 days. A single beetle bred in the office on 13th June, 1921, from a pupa collected in the field, lived for 365 to 368 days. This one was kept solitary for the whole period of its life.

The comparatively short life of the imagos in the seven lots quoted above is difficult to account for, as they were all kept under exactly similar conditions to the rest of the beetles. Details of the longevity of these imagos are given in Table C.

Of the remainder of this series the imagos in Lot E had a maximum length of life of 461 to 464 days to 31st July, 1922, and had not died out. These imagos were bred in the office from pupæ collected in the field. Progressive observations in the series in continuation of those given in the writer's second report, are appended in Table D. Those lots marked with an asterisk were bred in the office from pupæ.

A large number of tests have been made with different chemicals in order to ascertain what means can be employed for poisoning the beetles through the medium of baits. Banana corm has been used as the bait in all the experiments carried out to date. Both solutions and dry powders were used at different dilutions.

In each series of the "solution" tests three strengths of the solution were used. Pieces of corm were steeped in each strength for periods of time varying from one to twenty minutes, ten beetles being exposed continuously to each soaking of corm in each strength of solution for varying periods of time. In this way the optimum strength of solution and period for steeping the bait, as well as the period of exposure required to kill the beetles, were indicated from the one series.

In all the series of "dry powder" tests, the procedure was similar to that just given, except that one strength of the active principle was taken, and the pieces of corm were shaken up in the powder for periods varying from five to twenty minutes.

The tests were carried out in tins 4 inches by 3 inches by 2 inches, with lids, containing a little sifted soil in the bottom. At the expiration of the period of exposure of the treated material fresh corm was substituted for the pieces the beetles had been feeding on.

The chemicals tested to date are as follows:—

Sodium arsenite in solution and as a dry powder.
Mercuric chloride (corrosive sublimate) in solution.
Barium chloride in solution.
Lead arsenate as a dry powder.
"Paris green" as a dry powder.
Calcium arsenate as a dry powder.
Borax as a dry powder.

In some of the dry powder series wheaten flour was mixed with the chemical as a diluent.

The dry powders gave more satisfactory results than the solutions, as a general rule. Paris green was the most satisfactory, the next in order being sodium arsenite. Borax appeared to be a slow poison, and yielded fair results.

Sodium Arsenite in Aqueous Solution was used, in one case, at a strength equivalent to 1 lb. in 5 gallons (2 per cent.). Corm was steeped in this solution for as long as 20 minutes, and the beetles exposed to the poisoned material for periods up to 48 hours, resulting in only 1 per cent. being killed after 24 hours and 40 per cent. dying within ten days of the inception of the tests.

Sodium Arsenite used as a Dry Powder diluted with three times its volume of flour killed 92 per cent. of the beetles, after their being exposed for 18 hours to the poisoned corm, which had been shaken for five minutes with the powder.

Barium Chloride, at a strength equivalent to 1 lb. in 2 gallons of water (10 per cent.), had no effect on the beetles, 100 per cent. being alive 16 days after the inception of the series, the periods for the steeping of the corm and exposure of beetles being the same as in the case of the sodium arsenite solution quoted above.

Paris Green, diluted with six times its volume of flour, killed 99 per cent. of the beetles after three hours' exposure to the poisoned corm, the latter being shaken for five minutes in the powder.

A considerable amount of work still remains to be done before any definite conclusions can be formed, so that these results cannot be considered as final, but are indicative of a portion of the work that has been carried out on this matter to date. They show, however, that large possibilities exist of materially aiding the present control measures employed in combating the pest by means of poisoned baits. Field tests will, of course, have to be made after the completion of those in the laboratory.

These tests have been seriously handicapped in their execution by the constant need of large supplies of beetles which were not always forthcoming.

The condition of the plants regarding virility has no influence on the female beetle in determining her selection of site for depositing eggs. In corms and stems lying on the ground, however, eggs have never been found in any part showing decay.

Cavendish, Lady's Finger, and Sugar banana plants are all attacked equally badly by the beetle borer. A few Gros Michiel plants have been seen, but they have invariably been growing in areas apparently free from beetle-borer infestation. This variety of banana plant is badly attacked in other parts, and therefore it cannot be considered, from the above statement, to be a beetle-borer resistant variety.

The distribution of the pest is very largely brought about by planting infested suckers or butts. Cases have been met with, however, in which the origin of infestation is most baffling.

It is often difficult to detect infested plants, particularly in plantations where the beetle borer is not numerous. Suckers may be removed from an infested area carrying eggs, be planted, strike, and even grow into fair plants, while one or two larvæ are developing in them without showing noticeable signs of infestation. The beetles, once established in the plantation, will quickly make their presence felt unless measures to combat them are rigorously carried out.

NATURAL ENEMIES.

No trace has so far been found of the natural enemy (*Plæsius javanus*) of the beetle borer imported in small numbers from Java and liberated last year. Time will be required for it to multiply before it will be readily detected. This parasite, introduced into Fiji by Jepson in 1914, was not recovered in the field until the middle of 1921. Since then information has been received that further adults of this species have been collected there.

An Elaterid ("skip-jack") larva, very similar to that collected by Mr. Tryon in the Cooroy district in 1916, and again by the writer in 1921, was found in a larval tunnel of the beetle borer in the Buderim district on 14th March, 1922. Only a single larva was found, and this unfortunately died before reaching maturity.

CONTROL.

The basis for any means of control of the banana beetle borer must rest on keeping the plantation as free as possible from breeding grounds and harbourage (*e.g.*, old corms, butts, and cut stems).

A badly infested stool is only a menace to the remainder of the plantation and should, therefore, be dug out and destroyed. In slightly infested stools old butts and infested material should be completely removed and either burnt or chopped up into small pieces, and the stems should be split in halves lengthways. By the opening up of corms and stems in this manner they will dry up or rot rapidly and cease to serve as either breeding grounds or harbourage. Wherever infested material is found, pieces of clean corm should be laid, cut surface downwards, flat on the ground, in or just outside stools or on the spot where infested cut stems, &c., are met with. These will act as baits for the beetles, and should be examined once per day; in the morning is best. The beetles will be found either on the under-surface of the bait or just underneath the soil under the bait. They can thus be collected and destroyed. No bait should be used for more than ten to fourteen days, as eggs will be laid in them and they will be thus liable to serve as breeding grounds: these pieces of corm should, therefore, be collected periodically and destroyed and fresh ones put out in their places. This procedure should be continued as long as beetles are caught under these baits. *These measures must be carried out thoroughly and continuously, however, to be effective.*

In order to guard against the spread of the pest into a new plantation, too much care cannot be exercised (1) in the selection of suckers to be used for planting, to ensure that they are free from any risk of being infested by the pest; and (2) in ascertaining that the site for the plantation is not adjacent to a beetle borer infested area.

Suckers may be dug in an infested plantation and be free from beetle borer when removed from the stool, but lying on the ground, often overnight, they act for the time being as baits. Beetles attracted to them deposit eggs which are extremely

difficult to detect, resulting in infested suckers being planted. Any which die off after planting should be dug out and closely examined for signs of beetle borer, evidenced by grubs or their tunnels, and possibly by beetles themselves.

Old butts, sometimes used for planting, are more readily examined than suckers for the presence of beetle borer, as the larval tunnels at least should be readily seen when the butt is opened up.

Plantations laid out adjacent to beetle-borer infested areas are very liable to become infested on account of the beetles migrating from the old into the new area, particularly as the food supply in the former become exhausted. Corm baits should be laid around the edge of the infested area and carefully examined periodically, and wherever practicable it is advisable for the growers' own benefit to dig out and destroy the infested stools whenever opportunity offers.

The presence of beetle borer in a mature plantation is most readily detected at any stage beyond that of the egg, by the presence of larval tunnels in old corms and stems; often the grubs and beetles will be found. Suckers showing an unhealthy appearance should be dug out and examined for signs of infestation.

Preliminary tests have just been started to ascertain if any method can be obtained which will be applicable to field conditions to free infested stools of the pest and prevent any reinfestation, and to prevent clean stools from becoming infested through the medium of treatment of the soil. These tests are in far too elementary a stage to warrant any comment on them at present.

In conclusion, I wish to express my indebtedness to Mr. Brünnich and members of his staff for supplying and preparing chemicals for carrying out much of the work on the poisoning of corm baits.

CONCLUSIONS.

1. The rate of oviposition is greatly influenced by extremes in climatic conditions.
2. The development of eggs in the ovaries of the females is affected by the age of the beetles.
3. The rate of development of the different stages in the life cycle of the beetle is greatly affected by extremes of heat and cold.
4. The life of the beetle is very long.
5. Poisoning of corm baits, under certain conditions, as a means of killing the beetles has yielded promising laboratory results.
6. Co-operation of the growers with the scientific investigators is especially required.

TABLE A.

Lot. (See Table D.)	Eggs Laid for Months of—							From 25th May, 1921, to 15th December, 1921.	Total Eggs Laid to 31st July, 1922.
	1922 January, From 1st.	February.	March.	April.	May.	June.	July.		
A	7	7	0	..	..	..	..	242	256
B	0	3	6	23	0	..	..	237	269
C	2	5	11	3	0	..	..	680	701
D	25	45	27	20	..	..	..	260	377
E	2	0	0	3	0	0	0	50	55
F	3	9	17	21	5	6	1	445	507
G	45	52	117	176	57	68	16	1,153	2,084
I	24	36	58	119	36	36	21	1,323	1,653
J	0	31	52	26	5	6	3	436	559
K	16	21	16	29	1	3	3	608	697
L	10	13	43	24	0	0	0	345	435
M	5	14	9	..	..	..	..	18	46
N	10	21	29	11	5	0	0	..	76
O	1	2	4	0	..	..	..	..	7
P	3	4	8	0	0	0	..	..	15
Q	9	7	18	19	..	..	..	..	53
R	0	0	2	0	0	0	0	..	2
S	2	5	40	17	0	..	..	..	64

TABLE A—*continued.*

Lot. (See Table D.)	Eggs Laid for Months of— 1922. January. From 18th.	February.	March.	April.	May.	June.	July.	From 25th May, 1921, to 15th December, 1921.	Total Eggs Laid to 31st July, 1922.
T	..	..	0	83	8	8	2	..	191
U	..	..	..	13	2	1	0	..	16
V	..	..	..	..	47	26	14	..	87
W	..	..	..	..	1	2	0	..	3
X	..	..	..	..	..	..	2	..	2
Totals ..	164	275	547	587	167	156	62	6,198	8,156

TABLE B.

Eggs Laid.	Days to showing of first sign of Mandibles.	Days thence to emergence of first Larva.	Days for Total Emergence.
18-27 Jan., 1922	..	..	5-6
27 Jan., 1922, to 28 Feb., 1922	..	..	6-8
28 Feb., 1922, to 27 Mar., 1922	6	2	7-8
5-28 April, 1922	7	2	9-11
19-29 May, 1922	22	8	29-30
9-14 June, 1922	25	5	30-34
Minimum— 25 Jan., 1922, to 1 Feb., 1922 ..	..	..	4-5
Maximum— 9-14 June, 1922	25	5	30-34

TABLE C.

Collected or Bred.	Reference to Table D.	Dates of Collection or Breeding.	Dates of Last Death.	Life of Beetles in Days.	Life of Beetles in Lunar Months, &c.
Collected ..	A	24-28 Jan., 1921	10-13 Mar., 1922	406-413	14 months 2 weeks to 14 months 3 weeks
Collected ..	B	3-5 Feb., 1921	26-29 May, 1922	448-453	16 months to 16 months and 5 days
Collected ..	C	8-12 Feb., 1921	18-21 Apr., 1922	369-376	13 months and 5 days to 13 months 1 week and 5 days
Collected ..	D	21-25 Apr., 1921	22-26 May, 1922	392-400	14 months to 14 months 1 week and 1 day
Collected ..	F	29 Apr., 1921, to 5 May, 1921	25 Jul., 1922, to 1 Aug., 1922	446-459	15 months 3 weeks and 5 days to 16 months 1 week and 4 days
Bred ..	M	21-27 Oct., 1921	10-13 Mar., 1922	134-153	1 months 3 weeks and 1 day to 5 months 1 week and 6 days
Bred ..	N	15-24 Nov., 1921	17-25 Jul., 1922	235-252	8 months 1 week and 4 days to 9 months
Bred ..	O	25-28 Nov., 1921	26-28 Apr., 1922	124-129	4 months 1 week and 5 days to 4 months 2 weeks and 3 days
Bred ..	P	2-9 Dec., 1921	19-23 Jun., 1922	192-203	6 months 2 weeks and 4 days to 6 months and 1 week
Bred ..	Q	2-12 Dec., 1921	9-14 Jun., 1922	179-194	6 months 1 week and 1 days to 6 months 3 weeks and 5 days
Bred ..	R	1-12 Dec., 1921	26 Jun., 1922, to 12 Jul., 1922	196-223	7 months to 7 months 3 weeks and 6 days
Bred ..	S	16 Jan., 1922 ..	26-29 May, 1922	130-133	4 months 2 weeks and 4 days to 4 months and 3 weeks
Bred ..	..	13 Jun., 1921 ..	16-19 Jun., 1922	368-368	12 months and 1 day to 3 months and 4 days
Bred ..	..	16 Jan., 1922 ..	26 Jun., 1922, to 12 Jul., 1922	182-198	6 months and 2 weeks to 7 months and 2 days

TABLE D.

Lot.	A.	B.	C.	D.	*E.	F.	G.	H.	I.	J.	K.	L.	*M.	*N.	*O.	*P.	*Q.	*R.	*S.	T.	U.	V.	*W.
Approx. Date Collected.	29-1-21.	7-2-21.	12-2-21.	20-4-21.	27-4-21.	5-5-21.	21-5-21.	24-5-21.	4-6-21.	18-7-21.	1-8-21.	16-9-21.	11-27/10/21.	15-24/11/21.	25-23/11/21.	2-9/12/21.	7-12/12/21.	1-12/12/21.	16-1-22.	21-24/2/22.	14-15/3/22.	10-11/5/22.	20/4/22.
No. Collected.	38	132	281	37	16	87	379	26	324	85	119	72	6	24	20	9	25	9	16	50	16	190	9
Alive on—	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
28-10-21	50·0	28·8	33·1	86·0	56·0	93·1	92·4	19·2	91·7	100·0	96·6	80·6	100·0	..	..	..	..	..	..	..	..	..	..
25-11-21	48·2	28·0	31·3	78·4	56·0	91·9	90·8	15·8	87·8	96·5	94·9	72·2	100·0	100·0	..	..	..	..	..	..	..	..	..
8-12-21	47·4	28·0	31·3	78·4	56·0	91·9	89·4	15·8	86·5	96·5	94·1	72·2	100·0	95·8	90·0	..	..	..	..	..	..	..	..
9-12-21	47·4	28·0	31·3	78·4	56·0	89·6	89·4	15·8	86·5	96·5	94·1	72·2	100·0	95·8	90·0	100·0	..	..	..	..	..	..	..
13-12-21	47·4	28·0	30·9	78·4	56·0	89·6	88·9	11·6	85·2	95·3	93·3	72·2	100·0	95·8	90·0	77·8	100·0	100·0	..	..	..	..	..
17-1-22	15·8	28·0	29·2	78·4	50·0	85·0	82·8	7·7	77·1	82·3	92·5	63·8	66·7	91·7	70·0	77·8	88·0	77·8	100·0	..	..	..	..
27-1-22	10·5	28·0	27·0	78·4	50·0	81·6	80·2	7·7	72·1	72·9	90·7	62·5	66·7	91·7	65·0	77·8	80·0	77·8	100·0	..	..	..	..
27-2-22	2·7	25·7	18·1	62·2	50·0	79·3	75·2	7·7	65·4	60·0	86·5	48·6	66·7	91·7	55·0	77·8	80·0	66·7	93·8	100·0	..	..	..
13-3-22	..	20·1	7·8	48·8	31·3	77·0	73·1	7·7	62·3	52·9	53·7	43·1	..	87·5	45·0	77·8	64·0	33·3	81·2	100·0	..	..	..
20-3-22	..	18·1	5·6	40·5	25·0	77·0	71·4	3·9	59·3	47·0	42·0	43·1	..	87·5	35·0	77·8	64·0	33·3	81·2	98·0	100·0	..	..
27-3-22	..	14·4	2·5	37·8	25·0	72·4	68·6	3·9	55·8	45·8	34·4	38·9	..	75·0	30·0	55·5	60·0	11·1	81·2	98·0	100·0	..	..
26-4-22	..	5·3	..	10·8	18·7	58·6	55·6	3·9	45·9	27·0	12·6	29·1	..	41·6	5·0	11·1	32·0	11·1	43·7	84·0	75·0	..	..
28-4-22	..	4·5	..	10·8	6·2	57·5	54·8	3·9	44·4	27·0	11·7	29·1	..	41·6	..	11·1	32·0	11·1	43·7	74·0	68·7	..	..
19-5-22	..	0·7	..	2·7	..	36·7	45·3	3·9	36·1	17·7	4·2	22·2	..	15·8	..	11·1	8·0	11·1	18·7	64·0	56·3	100·0	..
26-5-22	..	0·7	..	..	..	29·9	43·0	3·9	31·4	15·3	3·4	15·3	..	12·5	..	11·1	8·0	11·1	6·2	56·0	56·3	100·0	77·8
29-5-22	..	..	..	..	..	27·6	40·3	3·9	29·0	12·9	3·4	15·3	..	12·5	..	11·1	8·0	11·1	..	54·0	50·0	100·0	77·8
14-6-22	..	..	..	..	..	14·9	34·3	3·9	23·1	10·6	2·5	11·1	..	12·5	..	11·1	..	11·1	..	44·0	43·7	99·5	77·8
23-6-22	..	..	..	..	..	6·9	29·3	3·9	20·6	10·6	2·5	8·3	..	8·3	..	..	..	11·1	..	38·0	37·5	97·9	77·8
26-6-22	..	..	..	..	..	6·9	28·5	3·9	18·2	9·4	2·5	6·9	..	8·3	..	..	..	11·1	..	34·0	37·5	95·8	77·8
12-7-22	..	..	..	..	..	3·4	21·8	3·9	16·3	7·0	1·6	1·4	..	4·2	..	..	..	..	..	26·0	18·7	91·6	77·8
25-7-22	..	..	..	..	..	1·1	16·8	3·9	13·2	4·7	1·6	1·4	..	..	..	..	..	..	..	22·0	12·5	89·5	77·8
1-8-22	..	..	..	..	6·2	..	15·0	3·9	11·4	4·7	0·8	1·4	..	..	..	..	..	..	..	22·0	12·5	89·5	77·8

SUGAR: FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports under date 7th September, 1922, as follows:—

Maryborough.—The areas under cane in this district are gradually being extended, especially in the direction of Magnolia. Much good land still remains to be cleared in this locality. As soon as the farmers get a guarantee of future stability, settlement will extend in these areas. Cane varieties making good progress on a number of farms are Meerah, Striped Singapore, Black Innis, N.G. 16, D. 1135, and 1900. Meerah has been giving good returns with an average c.c.s. value of 13 per cent. The growers are reminded to observe their cane carefully with regard to resistance, susceptibility, and tolerance to disease, and always keep ahead of them the fact that careful selection of plants is the most efficient method of keeping the field clean.

A cane which should do well in this district is E.K. 1. This variety is a good sugar-content cane, with a high resistance to disease, and of exceptionally good standover properties. Queensland 813 should be planted also. Farmers should guard against the unnecessary destruction of timber, as vegetation has a marked influence on the rainfall.

Pialba.—Cutting was in full swing at Pialba. The growers are going to have a fairly successful harvest, judging by the cane that is coming off and that which is to be cut. Cane varieties looking well at present are Shahjahanpur No. 10, Q. 813, Q. 970, Q. 1098, Q. 855, and H.Q. 77. These varieties are in a small plot established by a local grower. New canes obtained from the Sugar Experiment Stations very often do not get a fair trial, frequently being planted on a partially sterile portion of the farm—that which will not grow the staple variety. Of the canes mentioned above, Q. 970, Q. 1098, and Q. 813 should do well in the Pialba district. The growers in this area are advised to pay much attention to the question of deep cultivation and the planting of green-manure crops. Good fertiliser results have been obtained by using 5 cwt. per acre of a mixture containing 7 per cent. of nitrogen and corresponding quantities of potash and phosphoric acid.

Mount Bauple.—Growers here are doing good. If the farmers keep up the current standards in the subsequent cultivation, they will do much towards checking setbacks by dry spells. Varieties doing well at Bauple are Q. 822, D. 1135, Q. 813, and M. 1900 Seedling. Several growers are busy extending areas at present planted. The farmers' outlook is hopeful.

Very fair crops may be seen at Antigua. The prospect of stability in the sugar industry is acting as a stimulus, and it is the intention of settlers to extend their areas. Varieties making a good showing include D. 1135, Striped Singapore, Black Innis, Rappoe, M. 1900 Seedling, Mahona, and Malagache. Growers are advised, however, to concentrate on planting Q. 813, D. 1135, and M. 1900 Seedling as much as practicable. Green manuring should be undertaken as much as possible, as the colour and texture of the soil indicates a deficiency of humus.

Between Mount Bauple and Nambour, with the exception of Yandina, very little cane is growing at present. There is a big colony of ex-service men in these districts who have farms and who are looking toward the sugar industry as a means of making a living.

Nambour.—Progress is being made in this district with canegrowing. More attention is being paid to the question of liming and draining, especially on Petrie Creek and the Maroochy River, and the effect of these measures is already evident. The crushing here this year is going to be a good one. Conditions in this respect are better than was to be expected, as the heavy rains of early in the year were followed by an intensely dry period. Any growers who are ploughing out their stools after this cutting are recommended to get down as deeply as possible with the plough, and if possible to lime. Varieties on the Maroochy River and Petrie Creek areas that are doing well include Q. 813, H.Q. 285 (early maturing), N.G. 16, and D. 1135.

The growers are advised to include in their experiments Q. 970 and Q. 1098; also E.K. 1. Points farmers should note in studying canes are whether they strike well, if they are erect in manner of growth, whether the trash is adhesive or not, the resistance to disease and drought, and their c.c.s. value. Another important point is the standover qualities of the cane.

In the Mapleton district good progress is also being made with canegrowing. Mr. Story, who already has a considerable acreage under good milling cane, is extending his existing plantation by a number of acres. Some of the best canegrowing on the Maroochy River watershed is to be seen on the slopes below Mapleton, and the growers are strongly advised to keep on and extend their areas, keeping, however, out of the low-lying portions. The principal cane growing is H.Q. 285.

At Yandina, on the Maroochy River, there is a considerable acreage of cane growing. The variety Q. 813 is making an exceptionally good showing, as also is H.Q. 285.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date 5th September, 1922, as follows:—

Bowen.—A few days were spent in this district early in the month. The weather conditions were then very dry, the total rainfall for the year up to then only amounting to 23.61 inches, and of this amount 0.13 fell in April, 0.11 in May, and 0.50 in June. Luckily a fall of 2.40 inches in July helped to improve the outlook very considerably.

Going through the district some very good irrigated cane was noted, mostly the Gorus (N.G. 24, 24 A, and 24 B), Badila, Q. 855, and D. 1135. On Mr. Burrell's farm the four latter-mentioned canes (plant) were showing a very fine growth, whilst some first ratoons of Goru and D. 1135 also looked very well.

Mr. Burrell has now 7½ acres under cane, and has just planted another 8½ acres and intends to grub and plant a further 20 acres for next year. On Mr. Payne's property some really good Badila was also seen, good stools with a heavy barrel. His density returns from samples sent to Proserpine Mill were:—

Goru (ratoons), 16.8 c.c.s.
H.Q. 426 (plant), 16.5 c.c.s., November planting.
Badila (plant), 15.2 c.c.s., May planting.

Quite a number of the Bowen growers expressed their intention of increasing their areas. The Proserpine mill has erected a couple of fine derricks at the Don and Delta sidings for the convenience of farmers. Liming and manuring are receiving attention, as it is recognised that on small areas it will pay to get the best results possible.

Proserpine.—This area was also found to be suffering from the dry weather, as the rainfall for the seven months ending 31st July amounted only to 34.63 inches. Generally speaking, this year's crop will be a slight one, mainly on account of too much continuous wet weather last year and a shortage of rain in the growing period of this year, the result being that the autumn plant cane has not made the growth that it should have, and the ratoons are also very backward. The outstanding feature is certainly the very large area that is being planted for next year. In every part of the area this activity was most noticeable. With all the unused land in the Proserpine area, the local mill should be crushing a great deal more cane. The Torvale Estate has now some 70 acres, and Messrs. Phaff Bros. are just completing 50 acres.

The principal canes grown in this district so far are the Gorus (N.G. 24, 24 A, 24 B), Clark's Seedling (H.Q. 426), Malagache, Badila, with smaller quantities of D. 1135, Striped Singapore, M. 1900, and the newer varieties such as E.K. 1, Q. 813, Q. 855, Q. 903, Q. 1121, and Q. 116. Of these, H.Q. 426 is still a great favourite here and the cane now being crushed certainly justifies its popularity. Q. 813 also gave very fine average results in density last season, being second only to H.Q. 426. The latter's average was 14.5 c.c.s., whilst Q. 813 was 14.25 c.c.s.

A large proportion of the cane planted out this year will certainly be Q. 813.

Pests.—Proserpine district is, so far, fairly free from pests. A few borers were noticed in isolated places, and grubs have caused damage to a limited extent on Kelsey Creek, Cannon Valley, and Strathdickie. On the latter place Messrs. Redhead Bros. are still using dressings of arsenic on their plant cane.

Practically no grubs were in the areas so treated last year, but in one place this season the resultant first ratoons, which were volunteered and had no further dressing of poison, show a few grubs in one corner.

Far more liming and fertilising is now being carried on than formerly in the district, and the growers seem quite alive to the importance of this practice. Cane was coming in to the mill from Cannon Valley—mostly mountain-side grown.

Mr. J. Smith was cutting a fine crop of Badila that will probably return him a 40-ton crop per acre, and its density is 16 c.c.s. This crop was grown upon a rough and rocky hillside, and it says much for the owner's energy in planting and harvesting cane under such arduous conditions.

Another grower who is also growing upon a very rough hillside is Mr. Altmann. He was cutting a heavy crop of Striped Singapore, which, though cropping very well, was not too high in density.

Another farmer who is growing upon very rough ground and also has a very long and rough haul to the tramway is Mr. W. Hallam. If the advocates of cheap sugar had to grow cane under such hard conditions, their ideas might possibly alter.

Most of this hillside land is a dark volcanic chocolate and heavily studded with rocks.

On some of the lower-lying ground Q. 813 is doing very well, one gentleman getting 16 c.c.s. off some 10-months-old plant cane. Again referring to the quality of the cane now being crushed, the general average is about 15 c.c.s. H.Q. 426 is again giving some fine returns, one grower's average to date being 15.9 c.c.s. for plant cane. Q. 813 is running a good second, as one farmer's average for this cane is 16.1 c.c.s. M. 1900 also is very good, and only a shade behind Q. 813 in quality.

Whilst visiting the district some very cold weather was experienced, and this and the very dry spell were not conducive to the young plant cane making headway. With a fall of a few inches and some warm weather, the prospects for 1923 would be very much improved.

NEW SUGAR DISTRICTS.

BAMBAROO AND YURUGA.

The Director of the Bureau of Sugar Experiment Stations has received the following report dated 8th September, 1922, on new sugar-cane districts between Ingham and Townsville, from the Northern Field Assistant, Mr. E. H. Osborn:—

Bambaroo and Yuruga.—At the time of my visit, the conditions were found to be exceedingly dry. The total rainfall for the year had been only 34.59 inches. In the same period Ingham had 60.36 inches, and, naturally, under such dry conditions the growth of the cane was very backward.

Unfortunately, rainfall figures have not been kept for any length of time, and I was only able to obtain those relating to 1920 and 1921. These were 99.27 inches and 57.36 inches respectively, or an average of 78.31 inches for the period. Although the cane had made poor growth the density returns were very good, as the following figures show:—

A parcel of mixed Badila and H.Q. 426 (Clark's Seedling) from Mr. Hecht's farm went 17.45 c.c.s., and a nine-months-old plant crop of H.Q. 426 from Mr. D. Ross's place gave 15.90 c.c.s.

On Mr. Layton's place some H.Q. 426 ratoons with a few rows of Badila ratoons gave him an average of 16 c.c.s., and a tonnage of about 18 tons per acre. As a plant crop, he cut at the rate of 30 tons per acre, with an average density of 16 c.c.s. On Mr. Toale's farm a very heavy crop of Badila, going probably about 55 tons per acre, was being cut. This was growing upon a rich patch of dark scrub loam. The cane had been planted 15 months previously.

Some twenty-six farmers, with an acreage of about 208 acres, are supplying the Haughton Valley Mill from the siding between Rollingstone and Toobanna, and with good planting weather this number should be increased to about forty next year. Early in the season a tonnage of over 3,000 tons was expected in this locality, but the bad weather conditions have made these figures subject to a big reduction.

The areas visited were those adjacent to Bamberoo and Yuruga, or, roughly speaking, comprising the land on Waterfall and Waterview Creeks. These two creeks run from west to east across the railway line, which about here runs from south to north, and most of the cane land is upon the western side of the line and follows the course of these two creeks. The greater part of the land seen was either a fairly shallow, sandy, forest loam with about an average depth of 9 inches, or a darker and deeper forest loam that would probably average a couple of feet. The hills from which the creeks rise are mostly of granite formation. The country generally is very heavily timbered with Moreton Bay, blue and poplar gum, and a lot of bloodwood, whilst patches of acacia are found upon the heavier and deeper soils. Nearly all the farms visited consisted of very small patches of cane, the largest being Mr. Holland's, on Waterview Creek. He now has about 17 acres under cane, and hopes to plant another 20 in the near future. His area contains some very good land and is capable of considerable crop extension.

The light and shallow forest soils are capable of growing fair crops of high density cane, subject to good cultivation methods, but will require manuring fairly soon. The darker and deeper class of ground is capable of giving good cane returns for a considerable period, but will also benefit by being manured.

Although canegrowing is a new departure here, the residents are putting a good deal of energy into it. A small sawmill has also been installed at Bamberoo, and is engaged in cutting up tramway material for the Haughton Valley Mill.

PAPER MULCHING OF PINEAPPLES.

By A. T. LONGLEY, Board of Agriculture, Honolulu.

In consequence of the interest evinced by a large number of pineapple-growers in the Hawaiian method of growing pines under paper, which was noted in a recent "Journal," further information was sought. An opportunity of obtaining fuller knowledge presented itself when representatives of the Hawaiian Pineapple Company (Messrs. Barnes and W. H. McInerny) visited Brisbane in June last. Through the courtesy of these gentlemen we are now able to publish the full text of the article from an abstract of which our reference was taken.

A few years ago Mr. C. F. Eckart introduced a paper mulch for use in the production of sugar-cane, which is being used with great success in Hawaii. Mr. Eskart's patent rights covering paper mulch also include its use in the production of pineapples and various other crops. No experiments had been made with pine-apples, however, until 1919, when an experiment was planted in roofing paper by the Hawaiian Pineapple Company, Ltd., after Mr. Whitmore had seen the mulch in use on cane in Olaa. As a result of the excellent showing made by paper mulch in this and more recent experiments on both upper and lower lands, the Hawaiian Pineapple Company has acquired an option on all patent rights for growing pineapples in paper mulch. It is estimated that there are at present 461 acres planted in paper, 68 acres of which will fruit in 1922. The Hawaiian Pineapple Company has 431 acres, Libby, McNeill, and Libby 25 acres, and the California Packing Corporation 5 acres.

The first yields were obtained from paper-mulch plantings during the past season. These yields and the appearance of all paper-covered plantings, ranging from a few months to two years old, leave little doubt as to the value of the paper. Plants in paper grow uniformly larger, greener, and healthier, and produce larger fruit than plants grown without paper. The fruit maturing on paper mulch last season was very carefully weighed, as was that on adjoining check lines, and the results showed an average weight of 4 lb. 8.24 oz. for the fruit grown with paper, while that grown without paper averaged only 3 lb. 8.66 oz.; a difference of nearly 1 lb. Allowing 7,300 fruiting plants to the acre, this shows an increase of 7,107.2 lb., or a little over 3½ tons in favour of the paper.

As the plants on paper were in much better condition after the fruit was harvested than those grown without paper, it is believed that the first ratoon crop will show at least as great an increase as the plant crop, and that the second ratoon crop will also show a substantial gain. It is not improbable that the total increase will amount to 8 or 9 tons for the three crops, and that an additional ratoon may be grown at a good profit in many fields. Had the entire field in which the experiment was conducted been planted with paper mulch and yielded at the same rate as the experiment, the production would have been 23.3 per cent. greater. From the appearance of plants in paper mulch on the better lands which will bear next year, there is reason to believe that this high percentage of increase will be maintained or even bettered. The experiments being conducted by the California Packing Corporation (Libby, McNeill, and Libby) and the Hawaiian Pineapple Company cover a wide range of soil and climatic conditions, and in every case show a decided improvement from the use of paper. In all experiments where the plants have been growing a few months, the exact boundaries of the paper-covered lines can be established from a great distance by the increased growth and healthier colour of the plants.

While the greatly increased yield is the most important benefit derived from the use of paper mulch, it has many good points that recommend it. While no account has been kept of weeding costs, it is conservatively estimated that paper mulch will save two-thirds of this expense. The space around the plants which ordinarily takes the most time needs no hoeing, and the weeds between the lines can be fairly well controlled by cultivating. In addition to cutting labour costs to a minimum, it prevents the growth of weeds between the plants during long wet spells. Fertilising costs are also lowered, as it is not necessary to feed the weeds. It is expected that the saving in weeding costs for two years will pay for the greater part of the material and labour for applying the paper.

Paper mulch also prevents hard rains from packing the soil around the roots of young plants, and in dry weather keeps the plant-food more available by holding the moisture in the soil, where under ordinary conditions it would dry out and bake. Tests made during the hot, dry weather showed approximately double the amount of moisture in soil under paper as in soil without paper. At the same time,

temperature tests were made with and without paper mulch, which showed the soil under paper to be warmer by from 2 to 5 degrees, depending on the quality of the paper, and also showed a minimum ranging from 2 to 6 degrees higher at night. The temperatures were taken under several different makes of paper with recording thermometers such as are used in the canneries.

After successful experiments had been carried on by the Hawaiian Pineapple Company and others at Wahiawa, the Hawaiian Pineapple Association's experiment station planted an experiment in April of this year (1921) at Kailua, Oahu, which shows conclusively that paper mulch is far better for that section than any of the other fifty plots which were treated with various chemicals. The plant growth on the paper mulch is at least three times greater in weight and much healthier than other plots, only two plants out of 129 showing the least signs of weakness. Practically all plants in the chemically treated and check plots are small, weak, and of poor colour. There has been practically no rain at the experiment since it was planted, yet the soil under the paper has been kept in a moist and friable condition throughout, even when no signs of moisture could be found to a depth of 18 inches in other plots. Especially interesting is the fact that a plot of approximately 10 by 15 feet entirely covered with roofing paper shows even better plants than the adjoining plot, where only the lines were covered. The soil under the middle of this plot was apparently as moist and loamy as under the other. It is evident that it would be impracticable to put paper over a whole field, even though it were not necessary to cultivate. Space must be left for drainage and for the men in harvesting. If it is true that the control of moisture and temperature are factors in checking what is known as wilt, paper mulch may be the remedy.

The best and cheapest method of applying the paper, so far as known, is by hand. After the land has been properly prepared for planting, a sled is dragged along the slightly raised line, breaking lumps, smoothing the surface, and bevelling the sides slightly. The paper, which comes in rolls of about 500 square feet each, is fastened at the end of the line by putting some soil on it. A man, with an adjustable handle which fits in both ends of the roll, backs along the line, unrolling the paper. As the paper is unrolled a man on either side of the paper puts on enough soil with a hoe to keep the wind from tearing it until a small plow can throw a small amount of soil along both edges. Care should be taken, however, not to get too much soil on the paper, and it is sometimes desirable to have a man follow the plough with a broom to sweep off any excess. There should be a gentle slope from the centre of the line towards the edges of the paper in order that the water may run off quickly instead of standing in depressions between the plants. A crew of four experienced men can lay paper for $3.00 an acre or less. This figure will be reduced somewhat when the paper is cut in 300-feet lengths to fit the standard lines, instead of the 110 to 170-feet lengths, as at present, which necessitate an extra man in the laying crew to carry the rolls of paper from the field road towards the centre of the line.

An ideal paper mulch for pineapples should have the following qualities:—It should be 300 feet long, at least 36 inches wide for double lines, strong enough to withstand the weather for at least two years without shrinking or tearing, or rotting out on the edges where it is necessary to put the soil to hold it in place. It should also be waterproof and of good insulating qualities to hold the heat and moisture around the roots. In order to determine the relative values of different makes and qualities of paper for use in the production of pineapples, a comparative experiment was planted by the Hawaiian Pineapple Company on 3rd September, 1921, containing ten kinds of building, insulating, and specially made papers. The papers being tested are all 36 inches wide, but vary in length from 110 to 300 feet to the roll, in weight from 5 to 14 lb. per 100 square feet, and range in cost from $40.00 to $244.00 per acre. A close check is being kept on these different papers to see how they stand the weather, and careful records will be kept of the yields. At this early date it would appear that one of the cheaper papers will be the best adapted for pineapple culture.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Milking Records for August, 1922.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Miss Fearless ...	Ayrshire ...	30 May, 1922	660	4·5	35·10	
Hedges Nattie ...	Friesian ...	20 May, ,,	690	3·8	30·90	
Dawn of Warragaburra	Jersey ...	17 May, ,,	480	5·2	29·40	
Songstress	Ayrshire ...	4 July, ,,	750	3·3	28·80	
Confidence ...	,, ...	13 Aug., ,,	551	4·0	25·65	
Netherton Belle ...	,, ...	19 July, ,,	510	4·1	24·60	
Dear Lassie ...	,, ...	19 June, ,,	600	3·5	24·30	
College Cold Iron	Jersey ...	25 Jan., ,,	390	5·3	24·30	
Gay Lassie ...	Ayrshire ...	20 Feb., ,,	420	4·8	23·70	
Prim	Friesian ...	6 Feb., ,,	660	3·1	23·70	
Little Buttercup...	,, ...	12 Dec., 1921	600	3·4	23·70	
La Hurette Hope	Jersey ...	30 June, 1922	450	4·4	23·10	
Snowflake	Shorthorn...	20 Feb., ,,	510	3·8	22·80	
Lute	Ayrshire ...	8 Jan., ,,	480	4·0	22·20	
Magnet's Leda ...	Jersey ...	8 Feb., ,,	450	4·2	22·20	
Miss Betty ...	,, ...	17 May, ,,	420	4·4	21·60	
Sheila of Nundorah	Guernsey ...	6 April, ,,	360	5·0	21·00	
College Cobalt ...	Jersey ...	3 April, ,,	390	4·6	21·00	
College La Cigale	,, ...	10 July, ,,	420	4·3	21·00	
College St. Margaret	,, ...	16 June, ,,	360	4·8	20·10	
Lady Annette ...	Ayrshire ...	2 Jan., ,,	360	4·8	20·10	

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, AUGUST, 1922.

The month of August has been favourable for egg production. In the light breed section, Mr. N. A. Singer's six pullets laid the highest monthly total of 169, his "B" bird completing a total of 48 eggs before breaking off. Mr. C. H. Singer is next with a total of 156. In the heavy section Mr. R. Burns comes first with a total of 152 for the month, followed by Mr. Hindley with 145. The weighing of eggs is not quite completed, but it is pleasing to note the fine average size of eggs laid by the competitors. From present appearances it is thought that very few pens will fail to secure the full weight. One bird died during the month, the cause of death being bowel trouble. The following are the individual records:—

Competitors.	Breed.	August.	Total.
LIGHT BREEDS.			
*N. A. Singer	White Leghorns ...	169	580
C. H. Singer	Do.	156	548
*W. and G. W. Hindes	Do.	130	516
*Bathurst Poultry Farm	Do.	116	488
*W. A. Wilson	Do.	131	459
*T. Fanning	Do.	123	455
J. H. Jones	Do.	125	453
*G. Trapp	Do.	121	453

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	August.	Total.
LIGHT BREEDS—*continued.*			
*Mrs. L. Andersen	White Leghorns ...	126	445
*S. L. Grenier	Do.	133	443
A. C. G. Wenck	Do.	123	440
*R. Gill	Do.	137	428
*W. Becker	Do.	124	427
*J. M. Manson	Do.	131	423
*H. P. Clarke	Do.	131	422
B. Hawkins	Do.	126	417
*G. Williams	Do.	118	415
*O. Goos	Do.	122	415
J. Purnell	Do.	125	410
*J. W. Newton	Do.	134	402
A. Maslin	Do.	123	402
*R. C. Cole	Do.	123	395
*Harold Fraser	Do.	114	385
*C. Goos	Do.	128	383
*Oakleigh Poultry Farm	Do.	127	369
*Mrs. E. White	Do.	98	369
*Mrs. R. E. Hodge	Do.	132	364
T. H. Craig	Do.	115	357
*J. W. Short	Do.	122	356
*M. F. Newberry	Do.	115	351
*Thos. Taylor	Do.	127	349
G. F. Richardson	Do.	103	343
*C. M. Pickering	Do.	107	340
*R. C. J. Turner	Do.	126	339
W. J. Nairn	Do.	116	338
*F. Birchall	Do.	107	333
E. Stephenson	Do.	101	331
*E. A. Smith	Do.	110	321
B. C. Bartlem	Do.	100	320
E. Symons	Do.	114	317
A. Anders	Do.	104	282
Brampton Poultry Farm	Do.	113	271
H. Trappett	Do.	109	241
Parisian Poultry Farm	Brown Leghorns ...	86	110
HEAVY BREEDS.			
*A. E. Walters	Black Orpingtons ...	127	513
*R. Burns	Do.	152	493
*R. Holmes	Do.	129	481
*H. M. Chaille	Do.	134	473
*T. Hindley	Do.	145	473
Jas. Hutton	Do.	125	455
Mrs. A. Kent	Do.	126	453
Wambo Poultry Farm	Do.	114	429
*C. C. Dennis	Do.	139	404
*E. F. Dennis	Do.	118	397
*Jas. Potter	Do.	127	385
Mrs. A. E. Gallagher	Do.	127	385
*Rev. A. McAllister	Do.	98	377
R. Innes	Do.	136	367
Mrs. L. Maund	Do.	116	356
V. J. Rye	Do.	135	347
C. Doan	Do.	128	336
Jas. Hitchcock	Do.	129	328
H. B. Stephens	Do.	127	313
*Parisian Poultry Farm	Do.	136	302

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	August.	Total.
HEAVY BREEDS—*continued.*			
W. Becker	Chinese Langshans ...	124	302
C. Rosenthal	Black Orpingtons ...	104	285
W. C. Trapp	Do.	116	267
R. Burns	Silver-laced Wyandottes	136	219
*J. E. Smith	Plymouth Rocks ...	109	193
*Miss L. Hart	Rhode Island Reds ...	69	75
Total	...	8,547	26,443

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
N. A. Singer	83	112	89	99	97	100	580
W. and G. W. Hindes	101	85	94	88	99	79	546
Bathurst Poultry Farm	66	66	86	94	101	75	488
W. A. Wilson	74	69	61	91	76	88	459
T. Fanning	53	98	84	88	101	31	455
Geo. Trapp	87	62	67	86	74	77	453
Mrs. L. Andersen	92	53	80	75	68	77	445
S. L. Grenier	72	45	80	80	81	85	443
R. Gill	81	78	87	66	52	64	428
W. Becker	67	44	84	69	75	88	427
J. M. Manson	71	57	82	57	82	74	423
H. P. Clarke	75	55	73	80	73	66	422
G. Williams	64	73	79	70	67	62	415
O. Goos	69	51	80	89	75	51	415
J. W. Newton	87	67	79	49	74	46	402
R. C. Cole	76	76	77	37	65	64	395
H. Fraser	68	77	62	57	53	68	385
C. Goos	48	52	48	75	89	71	383
Oakleigh Poultry Farm	74	51	68	54	51	71	369
Mrs. E. White	82	11	70	45	83	78	369
Mrs. R. Hodge	85	34	58	60	75	52	364
J. W. Short	60	64	73	49	42	68	356
M. F. Newberry	62	34	48	89	46	72	351
Thos. Taylor	77	45	63	60	60	44	349
C. M. Pickering	77	72	40	54	58	39	340
R. C. J. Turner	60	46	71	66	62	34	339
F. Birchall	56	64	32	39	73	69	333
E. A. Smith	70	43	72	63	34	30	321
HEAVY BREEDS.							
A. E. Walters	84	81	75	82	97	94	513
R. Burns	74	87	68	92	87	85	493
R. Holmes	61	100	81	81	74	84	481
H. M. Chaille	99	70	88	82	82	52	473
T. Hindley	58	82	49	116	113	55	473
C. C. Dennis	66	79	71	60	71	57	404
E. F. Dennis	73	65	85	17	73	84	397
J. Potter	59	70	76	64	78	38	385
Rev. A. McAllister	73	81	94	39	11	79	377
Parisian Poultry Farm	35	57	60	31	60	59	302
J. E. Smith	15	41	30	26	40	41	193
Miss L. Hart	12	18	9	21	0	15	75

CUTHBERT POTTS, Principal.

THE PHYSIOGRAPHY OF NORTH AUSTRALIA—II.

By Dr. H. I. JENSEN, Geological Survey, Brisbane.

The first instalment of these notes, descriptive of the physiography of the Northern Territory, was published in the September Journal.

NORTH QUEENSLAND.

North Queensland is a peneplain elevated in the post-Cretaceous periods. The maximum elevation has been along the east coast. Elevation has been alternating with subsidence in the Gulf country, but the present tendency is for the land to gain on the sea principally through alluviation. Actual elevation is but slight, as shown by the Gulf rivers within Queensland, which are not cutting down their channels, but run for hundreds of miles before entering the sea as shallow, wide watercourses filled with sand.

North Queensland has been a continental area, or an area affected only by isostatic earth movements since the Carboniferous.

Mesas of Permo-Carboniferous sandstone lying almost horizontal survive at Mount Mulligan, between the Walsh and Mitchell Rivers and in the peninsular west of Cooktown. These are often almost conformably overlain by Jurassic rocks, and extensive flattops of Jurassic Sandstone are also scattered through North Queensland. These were formerly known as Desert Sandstone, but that term is now practically obsolete as a geological horizon.

Laterites occur extensively in North Queensland as disjointed cappings on tablelands, but are disintegrating, which is evidence of the climate getting wetter.

Great areas of North Queensland have been faulted down along the Pacific Coast in Tertiary times, and are now under the Barrier Reef.

The North of Queensland is from the physiographic standpoint divisible into three divisions:—

(*a*) The Pacific Slopes, with high rainfall, rich soils, and rough topography;

(*b*) The Mountainous Mining Belt, with poor soil, medium rainfall, rough barren topography, and very rapid drainage;

(*c*) The Gulf Country, which is roughly divisible into the same zones as the Northern Territory and has the same characters.

To (*a*) Division belong the Cairns, Atherton, Herberton, and Cooktown districts. The Hodgkinson, Irvinebank, Featherbed, and Chillagoe belts belong to (*b*) division, and the Einasleigh and Croydon districts belong to (*c*) division.

I append notes which I have made on the physiography of each of these districts.

The Pacific Slopes of North and Central Queensland are a subsiding area, but south of Great Sandy Island the coast is rising, especially around Moreton Bay.

The drying-up of swamps from natural causes has been noticed in active progress. Several areas of melaleuca swamp in the East Moreton (South Queensland), have in the last twenty years become dry Casuarina country.

REVIEW OF INDIVIDUAL DISTRICTS.

The Cairns Coastal Belt.

Taking this to mean the strip of country lying between the Barron River on the north, and the Herbert River on the south, the sea on the east, and the Atherton-Herberton tablelands on the west, the following is a brief resumé of its characteristic features:—

Physiography.—The belt is rugged in the extreme. High mountains rise abruptly from the very seashore or from a narrow alluvial coastal plain. Here and there disconnected outliers of the coastal range stand forth as conical peaks. Mt. Bellenden Ker, one of the peaks on the range itself, is the highest mountain in Queensland, although it is only a few miles from the coast.

Soils.—At the foot of the coastal range, rock waste from the denudation of these high mountains is accumulated to a great depth. Being derived from a variety of formations ranging from acid igneous rocks, like granite and rhyolite, and silicious slates, to basic igneous and metamorphic rocks, like basalt and amphibolite, the soils of the coastal plain are loamy and rich in plant food, yielding the excellent sugar lands for which the district is justly famed.

Rainfall.—The rainfall of the district is very high. Thus Geraldton, on the Johnstone River, over a period of twenty-two years has had an average annual rainfall of 145.71 inches, most of which falls in the months from December to March inclusive (Commonwealth Meteorological Bulletin No. 4.). The average annual rainfall of Cairns was given as 91.3 inches. During the dry-season months this belt receives light rains, known as "scrub rains," which are very beneficial to agriculture. There is a danger that if all the mountain scrubs be cleared these scrub rains will cease, and the fertility of the district would thus be greatly diminished.

Forests and Timbers.—As a result of rich soil and a damp climate, dense scrubs covered all the best of the country in its virgin state. In these scrubs flourished numerous species of pine, maple, cedar, mahogony, and other valuable timbers, which are being rapidly cut out without any thought of the future. On the less fertile soils the dominant forest flora consists of the usual tropical eucalypts, melaleucas (tea-trees) and acacias (wattles). Along the sea frontages and estuaries there are great mangrove jungles of future prospective value for the high tannin in the mangrove bark, and the considerable potash percentage in the ashes of the wood of the mangrove.

Sugar, cotton, coffee, rice, and most other tropical productions do well in the district. Citrus fruits and all tropical fruits grow luxuriantly on the talus soils at the foot of the hills. Apples, pears, and cherries will grow on the Herberton Tableland.

The Kangaroo Hills District.

Physiography.—This district consists of rugged mountains and ravines. The ranges and tablelands, which often exceed 2,000 feet in altitude, are built up of granitic and metamorphic rocks, here and there broken through by and capped with basalt of late Tertiary age, as at Mt. Fox, a quite recent basalt cone.

Soils.—The basaltic soils are good, but by far the largest area of the district has only very poor silicious soils.

Rainfall.—On the coastal plain at Halifax and Ingham the rainfall is heavy, but on the Kangaroo Hills it is comparatively low, averaging about 25 inches per annum, practically the whole of which falls in the wet-season months. For this reason even the basaltic soils constitute mainly forest country, scrubs being confined to the eastern slopes and a few moist gullies.

Timbers.—Spotted gum (*E. maculata*) woolly butt (*E. miniata*), ironbark (*E. melanophloia*), and bloodwood (*E. terminalis*) are the principal forest timbers on the hills. On the granite areas the dominant timbers were *Eucalyptus grandifolia, E. alba,* and in moist places *E. papuana;* on the metamorphics, ironbark (*E. crebra*) predominates, on the basalt around Mt. Fox, bloodwood (*E. corymbosa, E. terminalis*), box (*E. microtheca*) and blue gum abound, while on the desert sandstone we have abundant yellow-jacket (*E. trachyphloia*), ironbark, setose gum (*E. setosa*), wattle, and stunted bloodwood.

Cooktown District and Back Country.

Physiography.—Owing to the heterogeneous geological formations of this area, there are great variations of soil and climate. The immediate vicinity of Cooktown consists of high hills of granite and slate formation rising out of a narrow coastal plain consisting of the same rocks. Extensive alluviated flats cover the interspaces between the hills, and where these are periodically flooded by salt water from the Endeavour River, mangrove jungles constitute a physiographic feature.

Not more than 20 miles inland, following the railway line, we enter a low tableland from 500 to 600 feet high, built up of sandstones. Westwards this tableland extends nearly to Maytown, gaining an altitude of over 1,400 feet.

Rainfall.—The rainfall at Cooktown averages nearly 65 inches per annum, mostly wet-season rains, but on the sandstone tableland the average is probably only 40 inches.

Soils.—The soils of the district, being derived from acidic rocks, mainly are very poor. Some of the alluvial flats near Cooktown are fair, but the granite and slate soils are very mediocre. The sandstone soils further west are exceedingly bad, and neither suitable for cultivation or for pastoral pursuits.

Vegetation.—The granite slate soils near Cooktown have the usual tropical eucalypt flora (*E. papuana, E. grandifolia, E. terminalis* (bloodwood); *E. alba, E. tetradonta, E. crebra* (ironbark); and ironwood (*Erythrophleum*). The sandstone soils have only stunted gums, tea-tree (melaleuca and leptospermum species), hakeas, grevilleas, and a few acacia species. Bastard bloodwood (*E. latifolia ?* or *E. dichromophloia*) and ironbark (*E. crebra*) occur on a few conglomerate areas. Commercial

sandalwood occurs widely spread throughout the district on alluvial flats. It is one of the main products of the district to-day. The timbers observed to be most abundant on the Little Laura sandstones were stringybark (*E. tetradonta*), bloodwood (*E. terminalis or E. Abergiana*), bastard bloodwood (*E. latifolia ?*), ironwood, gum (*E. grandifolia*, also called erroneously Moreton Bay Ash), hakeas, wattles, grevilleas, capoc tree, and gardenia, with pandanus and tea-tree on the river banks.

Atherton-Herberton Tablelands.

Physiography.—We may regard as one physiographic unit all that strip of hinterland which is in part scrub-covered on the basaltic and slate areas. This type of country extends from Mt. Molloy, through Atherton, to Ravenshoe. The southern portion of the area is further divisible into the Barron upland plain and the Herberton tablelands. The Barron Valley has an elevation of 1,325 feet at Mareeba, and 2,466 feet at Atherton. The Herberton-Ravenshoe tableland is a step higher, averaging 2,900 to 3,000 feet. The area is rough in places, as on the eastern slopes of the Herberton plateau and in the Tinaroo Hills, but there are considerable areas of plain country representing late Tertiary basalt flows.

Rainfall.—The distribution of the rainfall is somewhat uneven, owing to the varied topography of the district. Those subdivisions of the tablelands, which are very rough and mountainous, get a higher rainfall than the more level areas, and the scrubs get scrub rains which often do not extend beyond the edge of the scrubs. The average annual rainfall is somewhere about 50 inches for the whole district. At Mareeba it is somewhat lower because the Dimbula granite area extends eastwards almost to the Barron Falls, and weathers evenly, yielding gently undulating country with poor soil. This area, therefore, approaches the Featherbed area in climate.

Soils.—The soils on the basalts are deep and rich, forming the excellent dairying lands of the Atherton and Ravenshoe districts. The granites have poor soils. Most of the metamorphic rocks yield poor soils also, but some, chiefly the amphibolite schists, yield very good soils. The basalt soils were scrub covered in the virgin state, except around Mareeba, where the inland type of climate prevails. The Barron plain is a broad valley infilled with basalt, which yields rich scrub soils. A large portion of the Herbert Valley is similarly basalt flooded, yielding a rich agricultural area.

The sudden steep fall of the coastal range to the east, and the occurrence of what seem to be Devonian rocks on the coastal plain, point to the presence of a big fault immediately east of the Tinaroo Hills.

Timbers.—The scrubs contain a varied flora, largely softwoods, including pine, cedar, maple, beech, and other valuable timbers. The forest country exhibits the usual relationship between geological formation and forest flora.

On the granites, box (*E. microtheca*), poplar gum (*E. alba*), and on moist flats river gum (*E. Tereticornis*) dominate; on diorite, bloodwood and ironbark; on the gneissen, bloodwood (*E. terminalis ?*); and on the metamorphic rocks, ironbarks (*E. crebra* or *E. leptophleba*) and gum (lemon scented, *E. citriodora ?*). In the Herberton district stringybark is also fairly plentiful on poor soils, both of granite and metamorphic origin.

Irvinebank-Emuford Area.

Physiography.—This rich mineral district is situated west of the Herberton district, and extends west as far as the Mount Garnet railway north to the Chillagoe railway. Irvinebank is in the centre. The area consists mainly of rocks of the Herbertonian series (Ordovician?).

The district is very rugged and mountainous, and in most places exceeds 2,500 feet in elevation.

The rocks most frequently met with are greywackes and chlorite schists, with some slates, quartzites, and phyllites, all intruded extensively by porphyries of the Featherbed type and by later granites with their dyke retinue.

Rainfall.—The rainfall at Irvinebank averages about 43 inches per annum. Most of it falls in the wet-season months.

Soils.—The soils of the district are mostly poor.

Vegetation.—Since the soils are poor and the rainfall is confined mainly to the wet season, there no scrubs in this district.

On the arkose-like greywackes of the district, as near Mount Albion, we have a yellow-jacket (*E. Trachyphloia ?*); on lode formations a gum-topped bloodwood known as "Dead Finish" is common (*E. Cloeziana ?*). On the granite country between Irvinebank and Stannary Hills we have broad-leaved ironbark (*E. melanophloia*), scented gum (*E. citriodora ?*), and pine. On the Featherbed porphyry rocks the narrow-leaved ironbark is the commonest tree, but on associated tuffs and more basic porphyries we also get lemon-scented gum, broad-leaved ironbark box (*E. leptophleba*), and pine. On the slates and schists, the scented gum, white gum (*E. pallidifolia ?*), narrow-leaved ironbark (*E. crebra*), and bloodwood are common. Poplar gum (*E. alba*) is also a common form on the porphyry country.

FEATHERBED RANGE.

Physiography.—This district is very mountainous and rugged. The rocks are of the same types as those of the Irvinebank area, but the porphyries predominate to such an extent that the district is very much more barren than its neighbour to the south. The elevation ranges from 1,500 to 2,500 feet.

Rainfall.—The average rainfall is about 36 inches per annum, practically all wet-season rains.

Vegetation.—On the porphyries between Boon-Moo and Petford, narrow-leaf ironbark is characteristic on the slopes and poplar gum (*E. alba*) on the flats. Where the porphyries are syenitic, bloodwood also comes in. Scented gum occurs in scattered places on tuffs and metamorphics where the depth of soil is sufficient.

On the acid granites near Lappa, silver-leaved ironbark (*E. melanophloia ?*), bloodwood (*E. latifolia ?*), pine (*callitris*), capoc (*bombax*), hakea (beefwood), quinine (*petalostigma quadriloculare*), grevillea, gum or ash (*E. grandifolia*) are the commonest woods. On the more basic rocks ironwood (*erythrophloia*), bloodwood (*E. latifolia*), narrow-leaved ironbark (*E. crebra*).

Soils.—The soils are exceedingly poor. The district is useless but for mining, and consequently contains only a few mining camps, including Bamford, Wolfram, Lappa, and Koorboora.

[TO BE CONTINUED.]

A SUMMARY OF SOME EXPERIMENTS CARRIED OUT BY THE BUREAU OF SUGAR EXPERIMENT STATIONS—V.

By H. T. EASTERBY, Director.

The first article of this series, in the course of which Mr. Easterby discussed deep cultivation experiments and tabulated comparative crop results from subsoiled and non-subsoiled fields, was published in the May Journal. The second instalment, an account of the results of irrigation experiments and the action of irrigation and manures upon the density and purity of sugar juices, appeared in the June issue. The third instalment, treating of experiments in fertilisation, was published in the August issue; and last month's journal contained an account of distance experiments and resultant crops.—Ed.

(A)—INTRODUCTION AND TESTING OF CANE VARIETIES.

One of the principal objects of the Experiment Stations is the constant introduction of new varieties, and their commercial testing. Before any cane varieties are allowed to leave the Experiment Stations they have to pass chemical and commercial

trials through plant, first ratoon, and second ratoon crops. Each variety is tested not less than four times during the sugar season, so that records are obtained giving farmers and millowners information as to whether canes are early or late, and as to whether their sugar contents are sufficiently high to warrant their adoption. This is combined with agricultural trials on the field, so that it may be determined whether such varieties are good croppers. They are further rigorously watched for evidence of disease, and no affected canes are allowed to go into distribution. When varieties have passed these trials they are carefully examined and packed before being sent to growers living at a distance from the Stations. Farmers close at hand are invited to visit the Stations and remove the varieties selected for distribution. The worthless varieties are discarded. Information of this kind could only be secured by growers and millers at the expense of much time and money and the rejection of many useless canes by the mills, which would be accompanied by severe loss to the growers.

It is proposed in this article to shortly summarise the introduction of the different varieties introduced by the Department of Agriculture and the Sugar Experiment Stations, with the ultimate results.

1895 TO 1904.

During this period 110 varieties of cane were introduced upon the Mackay Sugar Experiment Station, of which—

12 were collected in New Guinea by Mr. Cowley.
74 were collected in New Guinea by Mr. Tryon.
8 were introduced from Mauritius.
4 were introduced from Hawaii.
4 were introduced from Trinidad.
3 were introduced from South Africa.
4 were old Queensland canes—viz., Rappoe, Meerah, White Bamboo, and Striped Singapore.
1 was introduced from Barbadoes.

110

From 1895 to 1901, 16 of these (all from New Guinea) died out, but, it having been ascertained that some of them were still in existence at the Kamerunga Nursery, 10 of them were reintroduced at Mackay. From 1901 to 1907 these varieties were most rigorously tested, and every chance to prove themselves was provided. It was found that many of the canes, while showing a good sugar content, were so light in weight and difficult to cut that they were valueless from the farmer's point of view, and were discarded. Others developed the disease, but those of high class as sugar producers were planted out upon new land and carefully nursed in the hope of their recovering, which, however, they failed to do, so they were also discarded. A further number were found to be of small commercial value, and were also discarded. Out of the 110 varieties, therefore—

87 were discarded,
8 died out,
15 were retained as of commercial value.

110

The 15 retained were ultimately reduced to 4—viz., New Guinea 15 or Badila, N.G. 24 or Goru, N.G. 24 A, Striped Goru, and N.G. 24 B Green Goru. The mean sucrose and purity of six years' analyses are summarised hereunder:—

Name or Number of Variety.	Average of the Six Years.	
	Sucrose.	Purity.
New Guinea 15 (Badila)	20·68	94·4
New Guinea 24 (Goru)	18·79	93·4
New Guinea 24A	19·19	93·1
New Guinea 24B	18·42	91·6

The crop results for the six years were as follows:—

CROP RESULTS, 1904–1909.

Name or Number of Variety.	Plant Crop, 1904.		First Ratoon Crop, 1905.		Second Ratoon Crop, 1906.		Third Ratoon Crop, 1907.		Fourth Ratoon Crop, 1908.		Fifth Ratoon Crop, 1909.		Total Yield, Six Crops.	
	Yield of Cane per Acre in English tons.	*Yield of Sugar per Acre in English tons.	Yield of Cane per Acre in English tons.	Yield of Sugar per Acre in English tons.	Yield of Cane per Acre in English tons.	*Yield of Sugar per Acre in English tons.	Yield of Cane per Acre in English tons.	Yield of Sugar per Acre in English tons.	Yield of Cane per Acre in English tons.	Yield of Sugar per Acre in English tons.	Yield of Cane per Acre in English tons.	Yield of Sugar per Acre in English tons.	Yield of Cane per Acre in English tons.	Yield of Sugar per Acre in English tons.
New Guinea 15 (Badila) ..	59·8	10·8	53·8	10·1	41·6	7·7	43·0	7·9	34·0	6·3	38·3	7·4	270·5	50·2
New Guinea 24 (Goru) ..	63·5	11·1	51·8	8·5	33·0	5·5	54·0	8·9	61·6	10·2	Not Ratooned		263·9	44·2†
New Guinea 24A ..	58·9	9·6	51·3	8·9	36·7	6·3	41·0	6·9	42·1	7·3	36·7	6·5	266·7	45·5
New Guinea 24B ..	60·4	8·9	49·0	8·4	34·7	5·8	40·0	6·7	39·4	6·6	34·0	5·6	257·5	42·0

* The yield of sugar per acre means the actual sugar per acre produced by the crop, and not the amount recovered by the mills, which is a variable factor, depending on the modern or other character of each factory.

† Five crops only.

1905 TO 1908.

Ten Hambledon seedlings from the Colonial Sugar Refining Company were introduced upon the Mackay station during this period; also Mauritius Malagache, Barbadoes 147, and 6 Queensland seedlings. Of these the Hambledon seedlings 114, 222, 285, 426, 458, Mauritius Malagache, and Barbadoes 147 have been distributed and are still cultivated.

1909.

The following varieties were introduced during 1909, direct from Mauritius, viz.:—

Mauritius 779, 55, 87, 1237, 1022, 998, 1474, and 89.

Mauritius 189 and Gouve were also brought from the North to the Mackay station this year. Of these, M. 55, 87, 89, and 189 were distributed, and are still grown to a small extent.

1910.

During this year some 143 cane varieties were received by the Mackay station from the Acclimatisation Society in Queensland, and were planted out. These comprised Queensland, Barbadoes, and Demerara seedlings. They were received in very poor condition, being very dry and stunted, consequently only 98 germinated. Some of these later on died out, while others became affected with disease. Trinidad 211, Louisiana Striped, Demerara 117, and Demerara 604 were also introduced this year.

Of the above canes, the following were selected for distribution and are being cultivated:—

Name of variety.	Percentage of commercial cane sugar.
Q. 135	13.0
Q. 813	16.0
Q. 855	15.0
Q. 903	14.8
Q. 970	16.0
Q. 1001	14.5
Q. 1092	13.0
Q. 1098	15.5
Q. 1121	15.3
D. 1135	14.5
Hybrid No. 1	16.0
Badila Seedling	16.7

1912.

In September, October, and November of this year Mr. T. H. Wells obtained in New Guinea some 162 varieties. These were consigned to the Sugar Experiment Station at Mackay, where they were planted out by hand, special care being taken with each plant. These were thoroughly tested up till 1921, by which time nearly all of them were discarded as of little use to the industry, the commercial cane sugar content not being sufficiently high to warrant their retention and distribution, as they were not likely to be sought after by farmers in these days when the commercial cane sugar content is such a vital factor. There was nothing in the collection to come anywhere near Badila or the three Goruas. Of the 162 varieties, the following have been temporarily retained:—

Name of variety.	Percentage of commercial cane sugar.
N.G. 81	14.9
N.G. 89	14.7
N.G. 90	14.3
N.G. 94	12.5
N.G. 102	14.0
N.G. 103	15.0
N.G. 164	14.5

1914.

Two canes were introduced to the Mackay station this year—viz., Gingraya and Gingor. These were crosses raised by Mr. Crofton, of Ayr, from Mauritius, Gingham, and Oraya, and Mauritius Gingham and N.G. 24 A or Striped Goru. The latter is a good cane, containing 16 per cent. commercial cane sugar, and has been retained and distributed.

1915.

Shahjahanpur No. 10 was introduced from India with the advice that it would stand cold weather well. Its resistance to frost has been well established at Bundaberg and many other Southern districts. Its sugar content and cropping qualities have been good. The commercial cane sugar is 15 per cent.

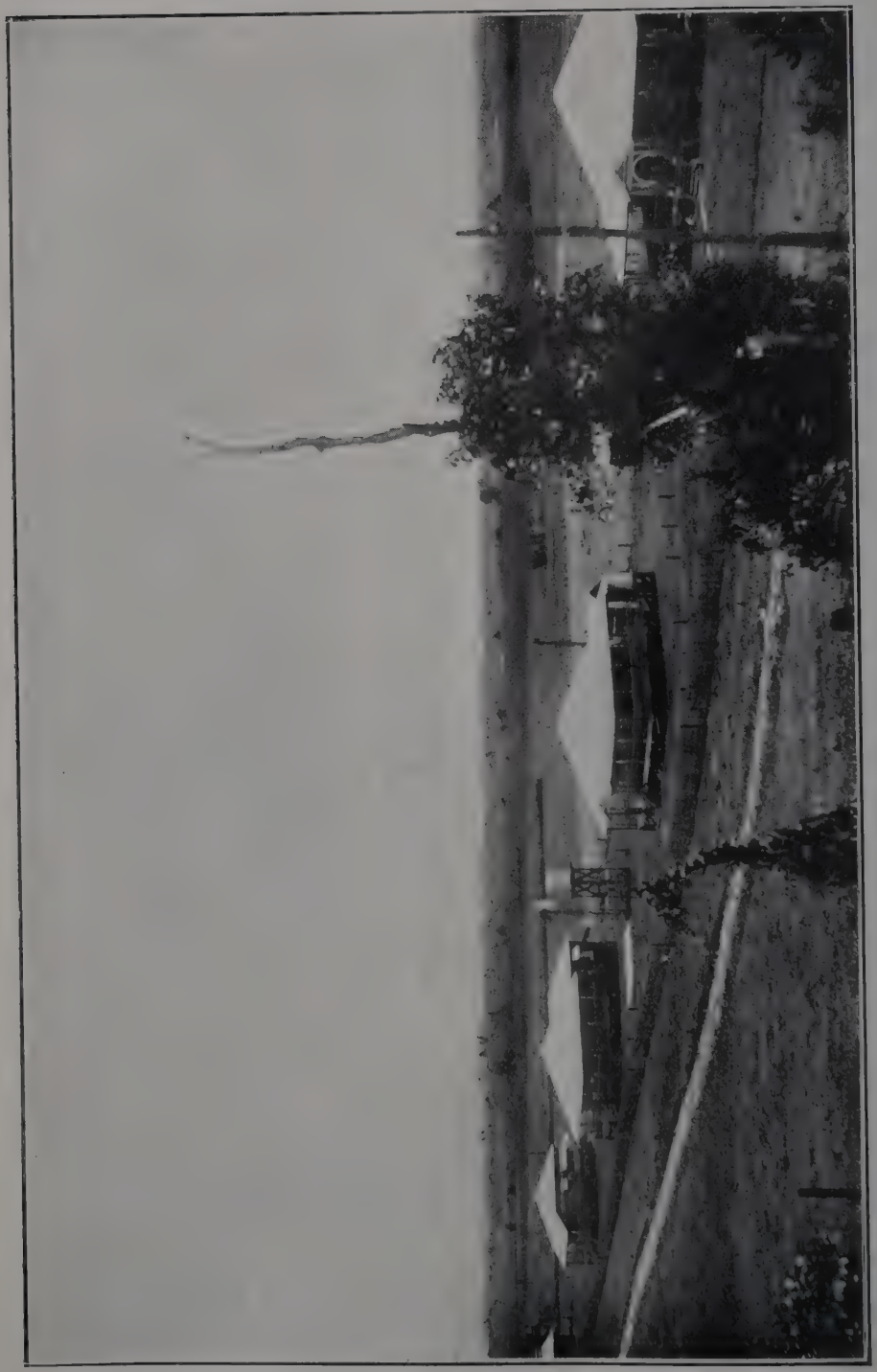


Plate 57.—Sugar Experiment Station, South Johnstone.

1916.

During this year the following varieties were introduced on the Bundaberg Sugar Experiment Station:—Mauritius 1504, 2904, 16804, 22204, Java E.K. 1, E.K. 2, E.K., 28, 100 Bont, 247 Generatie; and to the Mackay station per favour of the Colonial Sugar Company, from Fiji:—8 R. 431 and 7 R. 428. The only Mauritius cane out of those introduced this year that has been retained is M. 16804. All the Java canes have been retained so far, and E.K. 1 and E.K. 28 are very promising canes, and have been distributed. The 7 R. 428 or "Pompey" is also a good cane, and has been distributed.

1917.

From the Experiment station at Hawaii the Bundaberg Sugar Experiment Station received the following three canes, viz.:—H. 109, 146, and 227. The Mackay Station received from the West Indies B. 4030, 6450, 254, 4596, 6204, 4934, and Demerara 109; while the Colonial Sugar Refining Company supplied Obo Badila from New Guinea. Of these, B. 254, 6204, and 4934 died out. The three Hawaiian canes have been tested and are being distributed. The remainder of the West Indian canes are still under examination. Obo Badila has been distributed to canegrowers. It is apparently the same as the old N.G. 15 or Badila, but a new introduction.

1919.

This year a new lot of Mauritius canes was introduced—viz., M. 3210, 2810, 131168, 551182, and 5511. These are still being examined.

1921.

The following seedlings, which were discovered in the sandy bed of the Mowbray River, near Mossman, were sent to the Bureau by courtesy of the Mossman Central Mill Company:—Mossman Queensland 1, 2, 3, 4, 5, 6, and 7. These are being tested at the South Johnstone Sugar Experiment Station. No. 1 is a cane similar to Badila, and has been distributed. The remainder are still being tested. A further shipment of Mauritius canes, as follows, were also received at the Bundaberg Sugar Experiment Station—viz.., Mauritius 6414, 55143, 21958, 3395, 131126, R.P. 6, R.P. 8, and R.P. 73. These are still under examination. Two hundred seedlings were raised at the South Johnstone Sugar Experiment Station during this year and have been planted out on the field.

1922.

Fresh introductions of cane from foreign countries are being made this year.

GENERAL.

The beneficial results of the work undertaken at the Experiment Station in the constant introduction and selection by cropping and chemical testing cannot be overestimated. No cane has a perennial existence; sooner or later, if constantly grown, it is bound to fall a victim to disease, and the Bureau must be on the constant lookout for new canes. That only a few canes of commercial value can be obtained from large numbers tested is, of course, well known. Out of many thousand seedlings raised in Queensland only a few were finally selected. In Barbadoes over one million seedlings were raised, yet only four are in general use. At Demerara the same story obtains, there being only some seven canes that are of value out of considerably over a million raised. The farmer cannot undertake this work for himself, and must look to the Experiment Stations for the introduction of new canes. A very great expenditure in time and money is thus saved to the grower. If no more had been done than the introduction of the two canes Badila and Goru into Queensland, it would have amply justified all the money that has so far been spent on Sugar work.

TESTING OF CERTAIN VARIETIES OF CANE AT MACKAY.

Tests made at the Mackay Sugar Experiment Station for the purpose of determining the relative richness of H.Q. 426 (Clark's Seedling), N.G. 15 (Badila), N.G. 24 (Goru), Cheribon, Malabar, and Otamite.

A series of analytical test plots were instituted at the Mackay station in 1913 to determine the relative values of H.Q. 426, Badila, Goru, Cheribon, Malabar, and Otamite during the crushing period, June to December. The first series of these experiments were planted in the early part of the season—viz., March—and the second series in August of the same year. With the exception of time of planting, the conditions governing the experiments were the same in each case. Analyses of these two

plant crops of different ages were commenced in June, 1914, and continued till December of the same year. In the following year, 1915, the first ratoon crops were again tested over a similar period, as were the second ratoon crops in 1916. They showed conclusively that over the seven months the H.Q. 426, Badila, and Goru were of considerably higher sugar content than Cheribon, Malabar, and Otamite. The latter canes show a low analyses for the first three months, but from September onwards they considerably improve.

The results of the three crops from the early and late plantings are summarised hereunder:—

IN THE TABLE FOLLOWING THE RESULTS HAVE BEEN AVERAGED FOR THE THREE YEARS SO THAT THE SUGAR CONTENTS IN THE TERMS OF C.C.S. ARE APPARENT AT A GLANCE.

Variety.	Plant Crop, 1914. Average 7 Months' Analyses.		First Ratoon Crop, 1915. Average 7 Months' Analyses.		Second Ratoon Crop, 1916. Average 7 Months' Analyses.	
	Early Planting. C.C.S.	Late Planting. C.C.S.	Early Planting. C.C.S.	Late Planting. C.C.S.	Early Planting. C.C.S.	Late Planting. C.C.S.
	%	%	%	%	%	%
H.Q. 426	16·0	16·6	18·4	18·8	14·9	15·0
Badila	15·1	16·6	19·8	18·7	14·9	14·5
Goru	13·2	13·9	17·0	16·4	12·7	12·2
Cheribon	12·6	12·6	15·6	15·5	12·4	11·7
Malabar	11·8	11·8	15·0	15·3	11·4	11·3
Otamite	11·0	11·4	15·0	15·0	11·5	11·0

Although the three latter canes are not much grown outside Mackay, the results are generally interesting, particularly having regard to the action of the Central Sugar Cane Prices Board in fixing, in most instances, analyses as the basis of payment for cane.

CERTIFICATES OF SOUNDNESS.

Certificates of Soundness as under-listed were issued in the course of September, 1922 :—

Name of Stallion.	Breed.	Period for which Certificate issued.	Owner's Name.	Owner's Address.
Silver Son ..	Blood ..	Life ..	F. Dreyer ..	Eagleby, Beenleigh
Veresdale ..	Blood ..	Life ..	W. Elliott ..	Veresdale, Upper Logan
Some Wilkes..	Trotter ..	Life ..	C. F. Pinnaud ..	Eagleby, Beenleigh
Spark ..	Trotter ..	Life ..	J. E. Wallace ..	Red Hill, Gympie
Marvin Cole ..	Trotter ..	12 months	H. Dunkley ..	Withcott, *via* Helidon

"BUNCHY TOP" DISEASE IN BANANAS—INTERESTING EXPERIMENTS.

Mr. T. Brooks, of Highfield, Murwillumbah, claims to have discovered a cure for the "bunchy top" disease in bananas. In 1920, Mr. Brooks treated portion of his plantation with sulphur, but this did not have the effect desired. In May last, root rot set in, and in December it appeared as if the whole plantation was "settled." Mr. Brooks now contends that the sulphur applied last year, at the rate of about 8 cwt. per acre, together with island fertiliser, plays an important part in the treatment he is now applying. He has started with a mixture which he calls basic super, which contains 45 per cent. lime and 17 per cent. phosphoric acid. This was applied in some cases around the stools to a radius of 3 feet or 4 feet, in two plots. The whole surface was treated with from 8 cwt. to 10 cwt. per acre, and the suckers before being planted were well dusted with the mixture. All suckers planted were taken from "bunchy top" stock, but of the 800 planted since April not one, so far, appears to be affected with the disease. On the contrary, every leaf shows splendid colour, and the stems are strong and vigorous, while the growth for this time of the year is exceptional. Old stalks up to 5 feet high, which obviously were badly affected with the disease, are now throwing out vigorous centre leaves and evidencing fullness of sap.

Although the experiments are only in part developed, and a whole season is necessary to stamp them as conclusive, the hearty growth of every plant treated, and the unusual crop of peas, beans, and other vegetables, demonstrates that Mr. Brooks has developed a wonderful growth force in his soil.

Mr. Brooks is making his discovery public in order that it might form a base for further experiment should it fall short of expectations. His line of reasoning is that the application of the sulphur renders the phosphates soluble, so that they can be readily taken up by the plant, hence the rapid growth following the sulphur treatment. But this also allowed the heavy autumn rains to wash the phosphates out of the soil, which accounts for the return of the disease after the rain last year. The sulphur remaining in the soil acts as a fungicide, and connecting with the basic super, assists the restoration of the lost sulphates. The lime contents give a warmth and sweetness and stimulate the root growth.

Discussing the matter recently, the Minister for Agriculture and Stock (Hon. W. N. Gillies) remarked that developments in this connection were being closely watched, and that his Department is in communication with the New South Wales authorities on the subject. From departmental information there is very little evidence of "bunchy top" in Queensland.

SCIENCE NOTES.

By EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

THE INFLUENCE OF CHEMOTROPISM ON *LEPIDODERMA ALBOHIRTUM* WATER.

The chemotropic response of insects to artificial stimuli is a subject worthy of close investigation, and one which presents a wide field of possibilities in connection with the control of various destructive species.

Most entomologists are aware of the fact that insects as a rule react positively, or, in other words, are attracted towards their food or that of their future offspring by

the presence of various odours emanating from it; which, although of a nature far too subtle for us to perceive, are, nevertheless, appreciable to creatures endowed with highly specialised olfactory organs.

Chemotropic reaction occurs also during the periods of mating and oviposition, the sexes in many instances being able to approach and find each other from long distances by the help of certain odours secreted by special scent-glands; while the egg-laden female is similarly guided during her search for suitable food for the future larvæ.

Entomologists have not been slow to realise the economic significance of this method of combating insect pests, much attention having been given of late years to the construction of bait-traps for attracting fruit-flies, vine-moths, &c.

With regard to the question of controlling our grey-back cane-beetle by means of aromas, we have good reasons for assuming that the movements of this insect are very sensibly affected by forces of a chemotropic nature, which probably exercise important influences on the flight of the females during the period preceding oviposition.

Initial experimentation with aromas was carried out by the writer in December, 1915, when it was discovered that grey-back beetles reacted negatively towards such odours as cajeput oil, acetic and carbolic acids, nitro-benzine, oil of almonds, &c. but were not in the least influenced by odours arising from oil of cloves, fish oils, or even the fumes of 40 per cent. formalin.

The olfactory sensibilities of this species, however, were amply demonstrated, and I felt justified in believing that reaction of a positive nature was certainly attainable.

With a view to securing further data in this connection, these experiments were continued last December (1921), the odours used being placed in small tins 4 inches deep by 3½ inches in diameter, and resembling those emitted by the stem and foliage of chief food-plants of the beetle, together with miscellaneous aromas such as arise from decaying vegetation, soils, roots, &c.

Some of these bait-traps were exposed in cane fields, being simply let into the ground between rows of cane, with the top edge of the tin level with the surface, while others were hung among the branches of a large native fig (*Ficus pilosa*), which is a favourite feeding-tree of the beetles (*see* photo. in "Queensland Agricultural Journal," Vol. xvii., p. 38).

With regard to the anatomy of the antennal organs in Lepidoderma, it will be noticed by the accompanying illustrations that the four plates composing the club are closely covered with olfactory pits or pori (Fig. 1), each containing a central peg-shaped body of very variable form and length, usually tipped with a short seta or bristle.

An outline of a vertical section of four of these pits is shown greatly magnified at Fig. 2, and a plan of two of them at Fig. 3.

Each peg is connected with the olfactory nerve by means of a delicate fibre, indicated diagrammatically in the section at Figs. 4, 4.

These pits, which occur in the chitinous portion of both sides of the two inner lamellæ of the female and on the inner surfaces of the outer plates, number about 18,500, and in male specimens 24,500.

In the latter sex, however, the club consists of five plates, the fifth being one of the outer ones, and usually smaller than the others.

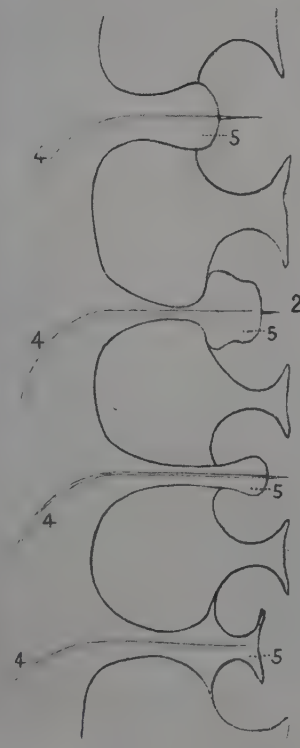
Whilst feeding or resting on the trees in a torpid condition, the antennal lamellæ are held close together in the form of a solid-looking club, but when flying, or under the influence of excitement, the beetle opens them out fan-wise, in order to expose to the air the greatest number of olfactory nerve fibres.

There can be little doubt that the highly sensitive antennæ of this insect help it to locate the position of favourite feeding-trees, since isolated specimens of such figs as *Ficus pilosa*, *cunninghami*, &c., are usually loaded with beetles each season, although often growing alongside or close to food-plants that happen to be less palatable.

We are making preparations for experimenting during this coming season with a large variety of aromas, comprising various essential oils and aromatic essences, &c., distilled or extracted by the process of enfleurage from favourite food-plants of our grey-back cane-beetle.

I have already pointed out the importance of this ideal control method (Reports Sept. 1914 and Nov. 1921), which may enable us to capture the female beetles before they have had time to deposit eggs.

In the event of success in this connection being obtained, it would then be a comparatively simple matter to design suitable traps of a mechanical nature that, when baited with the attractive aroma could be so arranged in cane fields as to lure to destruction most of the invading beetles.



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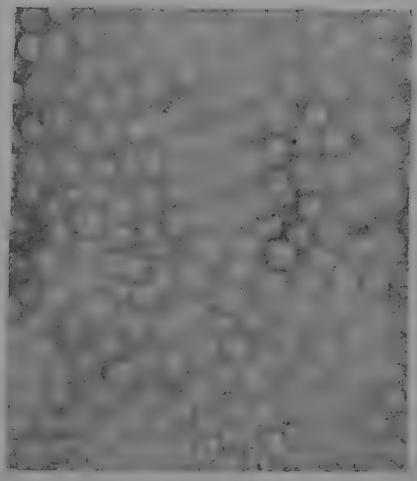

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Del. E Jarvis (original), Photos Cottrell-Dormer.

Plate 58.—(For description, see page 310).

DESCRIPTION OF PLATE.

1.—Olfactory pits in lamella of antennal club of *Lepidoderma albohirtum* Waterh. × 620.

2.—Diagrammatic section through same, showing four pits containing central pegs with apical setæ (5, 5.); connected with olfactory nerves (4, 4.) × about 9,000.

3.—Plan of two olfactory pits, showing sensitive pegs.

4.—Antennal club of female with lamellæ opened out. × 28.

Photo: G. H. Worth.]

PLATE 59.—COCOANUT TREE ON JOHN DANIEL JOYCE'S PLANTATION, "WAI VURI," INNISFAIL.

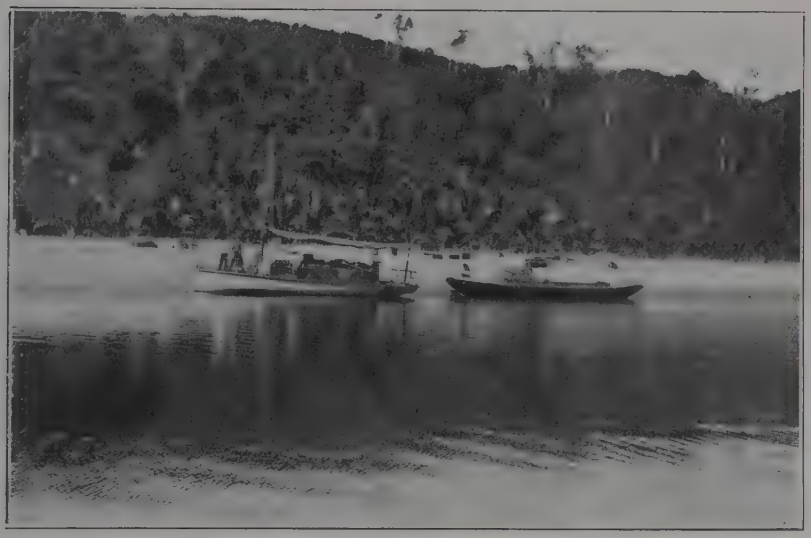

Photo: G. H. Worth.]

Plate 60.—John Daniel Joyce's Plantation, "Wai Vuri," Innisfail.

Plate 61.—14,000 Bags of F.A.Q., Allora Wheat Dump, 1922.

SOME PRIZE-WINNERS, ROYAL NATIONAL SHOW, BRISBANE, 1922.

Plate 62.—Judging the Jerseys.

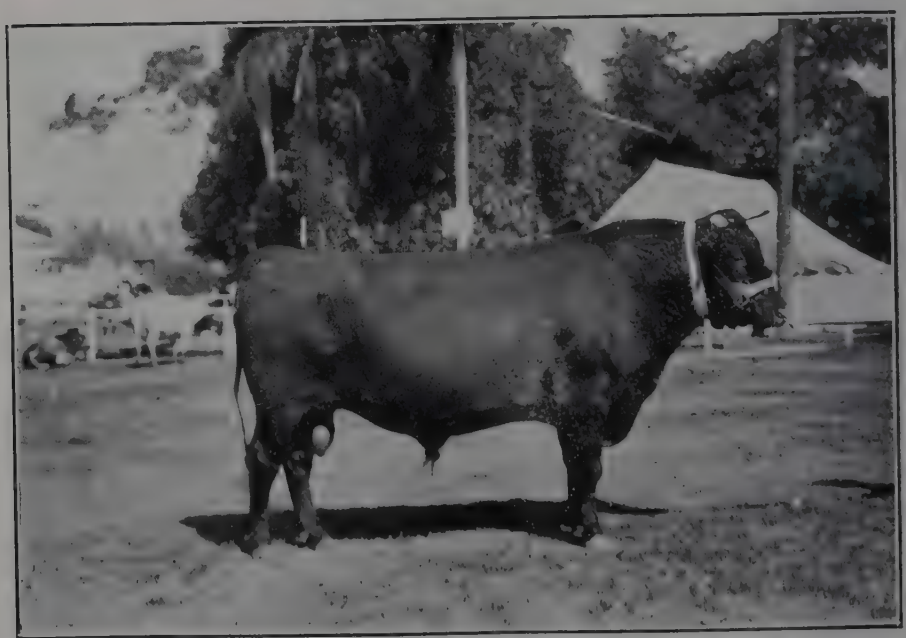

Plate 63.—I.M.S. Bull, Thor of Greyleigh. The property of G. E. J. Chaseling, Brunda Coolabunia, Q.

Plate 64.—A Closer View of Thor of Greyleigh, Winner of the Three-Year-Old I.M.S. Bull Class, and one of the Nicest Specimens of the Breed that we have at present in Queensland.

He is a son of Joffre and Dandy 4th of Greyleigh. First in the powerful three and under four class, National, 1922. His wins include first and champion at Wondai, 1922; first and champion at Murgon, 1922; first for bull and progeny at both the before-mentioned shows, and many other prizes.

Plate 65.—Fuchsia of Strathdhu (431).

By Victor 2nd (27), dam Carnation. First prize I.M.S. cow five years old and over, in milk, and champion. Bred by and the property of S. Mitchell, Warwick, Q.

Plate 66.—Margaret Anglin 2nd of Berry (81).

By Powerful of Brundee, dam Margaret Anglin. First prize and champion Friesian cow. (Record, 13,200 lb. milk and 533·76 lb. butter in 273 days.) The property of Mr. S. H. Hosking, St. Gwithian, Toogoolawah, Q.

Plate 67.—Maud Rooker Korndyke (imp., 589).

By Tsussie Rajah, dam Minnie Rooker Tsussie. First prize Friesian heifer, 2 years and under 3 years, in milk, and Reserve Champion, Brisbane Royal National Show. The property of Mr. Fred G. Brown, Mooroombin, Toogoolawah, Q.

Plate 68.—Champion Friesian Bull, Menelens of St. Albans (McLeod).

Plate 69.—Oxford Palatine Sultan (1126),

By Prince Palatine (imp., 760), dam Sultane 4th of Oaklands (imp., 1398). Third prize Jersey bull four years old and over. The property of Mr. W. S. Conochie, Brooklands, Tingoora, Q.

Plate 70.—Jean 5th of Blacklands (303).

By Sir Hugh of Hillview (26), dam Jean 4th of Blacklands (100). Second prize cow, five years old and over, in milk, and reserve champion. Bred by and the property of A. Pickels, Blacklands, Wondai, Q.

Plate 71.—Lorna of Arley (50).

By Captain, dam Lady. First in both classes for cow, four years old and over, averaging the greatest daily yield of butter fat for 48 hours, with 6·587 lb. butter; winner of the special prize for cow, four years old and over; second in class for cow yielding the largest supply of milk in 48 hours, with 132·9 lb.; and winner of the National champion butter fat test. Bred by and the property of E. D. Lawley, Arley, Maleny, Q.

Plate 72.—Jellicoe of Marinya (914).

By Gordon of Marinya (186), dam Iduna of Marinya (515). First prize Bull, three years old and under four years, and champion Ayrshire bull of Queensland, Brisbane Royal National Show. Bred by and the property of J. H. Fairfax, Marinya, Cambooya, Q.

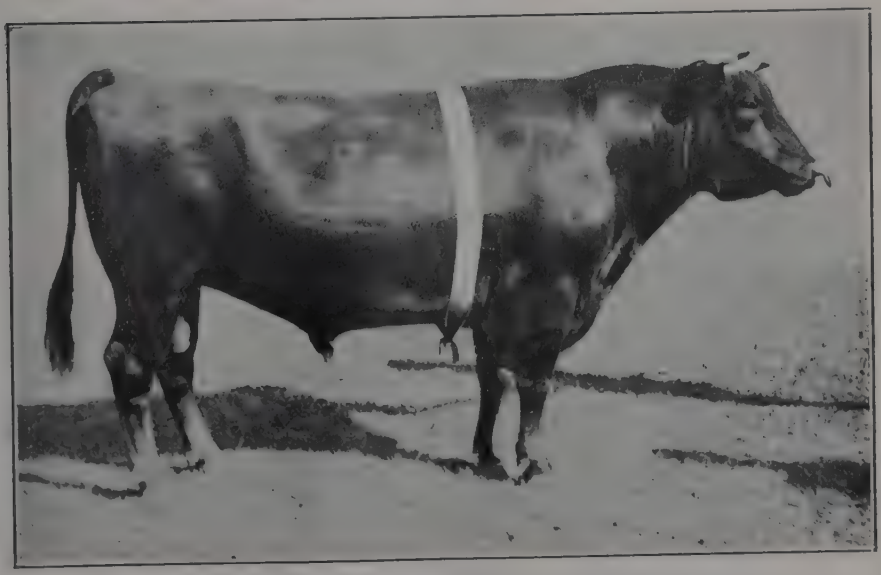

Plate 73.—Sovereign of Warden (p.i. I.M.S.H.B. of A.).

By Ensign of Warden, dam Folly. First prize I.M.S. bull, four years old and over, and champion. The property of F. O. Hayter, Spurfield, Pomona, Q.

Plate 74.—Oxford Golden Noble (1128).

By Prince Palatine (imp., 760), dam Oxfordia of Oaklands (1397). First and Champion Jersey bull; first for sire and three of his progeny, first in exhibitor's group, first in sire's progeny stakes group. This is the third year in succession that he has won the championship. Bred by and the property of E. Burton, Wanora, Q.

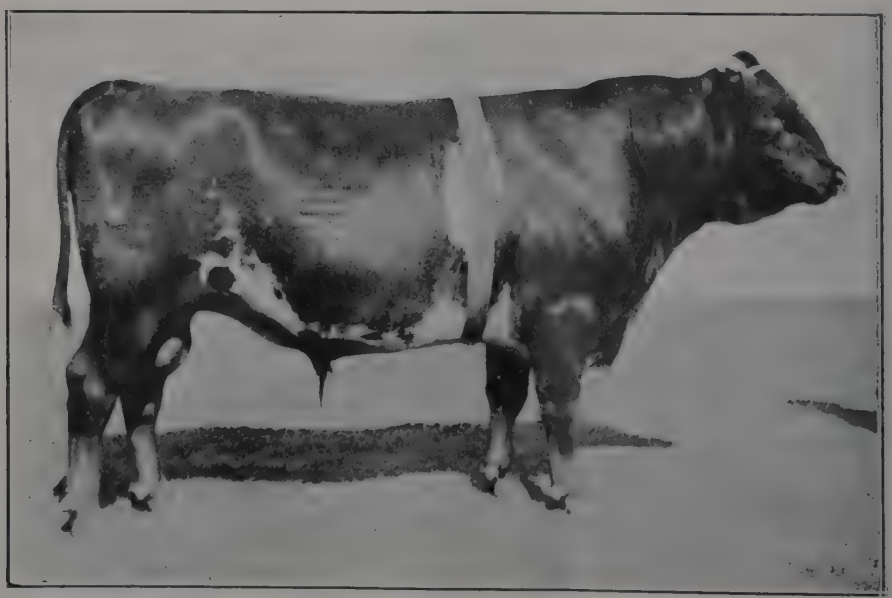

Plate 75.—Charm's Duhalow of Oakvale (p.i I.M.S.H.B.).

By Gem's Plum of Hillview, dam Charm of Glenthorn (213). First and reserve champion, and first in both groups. The property of Ben. O'Connor.

Plate 76.—Oxford Girl (2210).

By Passy's Golden King (382), dam Buttergirl (411). Second prize cow, 5 years and over, in milk; first for Australian-bred Jersey; and reserve champion, Brisbane Royal National Show. (Record 2·005 lb. butter in 24 hours.) Bred by and the property of E. Burton, Wanora, Q.

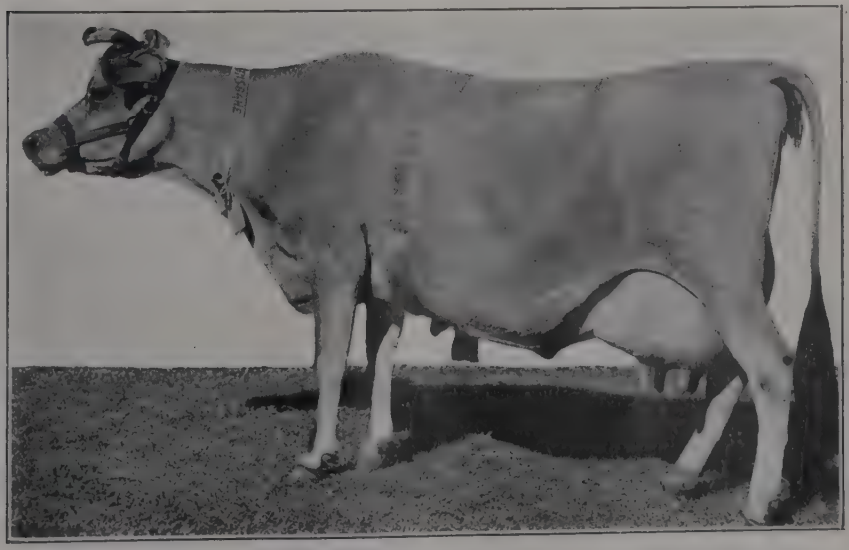

Plate 77.—Larkspur.

Champion Jersey Cow, and lately the property of W. and D. Carr, Indooroopilly. Larkspur, a great prizewinner in every Jersey class in the show ring, died last month.

Editorial Notes.

Building up The Agricultural Industry.

It is believed that the Queensland Producers' Association will do much towards building up a real rural civilisation in this State. It is an outcome of a great movement, a movement inspired by a big ideal, possessing strong dynamic power governed by a great central idea. It is a movement which even now seems much bigger to those outside it than to those inside it. A man on the edge of a crowd can best measure its greatness and force. Complete organisation of the agricultural industry is now being transferred from the sphere of academic argument to the field of fundamental fact. Perhaps the most encouraging thing about the organisation now going on in Queensland country districts is the caution with which the proposal has been received and the restrained enthusiasm of those by whom it has been accepted. Experience shows that many similar movements have often been spoilt at the outset by being overwhelmed with the rush and gush of unrestrained rhetoric and the badly balanced zeal of unthinking enthusiasts; but when a movement is based solidly on business principles and guided by men of experience and broad vision, who are capable of thinking nationally as well as sectionally, then its success follows in natural sequence.

* * * * * * * *

There can be little orderly building in an industry unless the people concerned are of one mind. There must be an idea, in the sense of vision, of larger results and better conditions common to the greatest number. Legislation can make, provide, and has provided the plans and specifications of a great rural development in Queensland, but the farmers must do the building. The hope of prosperity by ballot is the last excuse between them and the stern realities of hard work and paying the price. Men and women do not grow strong except by overcoming obstacles.

* * * * * * * *

To those of us who have had an opportunity of studying on the spot the conditions of agriculture in the older countries, there appears to be one big difference between farming in Australia and in Europe. Here farmers produce crops and let their industry go at that. They stop at production. Someone else prepares the product for market and markets it. In Europe farmers do not let their interest in their produce end when the last load has gone over the weighbridge. When their crops are bagged, bailed, and crated, individualism ceases, and co-operation is applied to prepare their produce for market, control its sale, and finance the whole operation. In Queensland to-day agriculture stands on one foot; in Europe it stands on four. With agriculture thoroughly organised and backed by statutory power, anomalies should cease to be, and rural life and industry should regain its rightful place as the most vital factor in our national life.

* * * * * * * *

Civilisation was not built on a few square miles of bricks and concrete. Cities grow big because they suck up the wealth of the country. Babylon and Nineveh built their skyscrapers on the energy of the toilers on the soil. Ancient Rome was a humanity-absorbing vortex. These cities were great, but their greatness was not a source of pride in the hearts of the farmer who starved that their citizens might feast, who grew the grapes to make their masters drunk. If farmers are to obtain and retain a fairer reward for their energy and enterprise, if they are ever to enjoy the comforts and advantages of a real civilisation, they must make it their steady, persistent, and fundamental policy to work towards complete control over the manufacture and sale of their primary products. Such a policy comes well within the ambit of the Queensland Producers' Association, an association whose sponsors and constituents are alike bent on realities.

Event and Comment.

Agricultural Legislation.

The present Parliamentary session is noteworthy for the number of measures dealing with various phases of the agricultural industry. Included among the legislative proposals submitted were the Water Power Bill, Primary Products Pools Bill, Irrigation Bill, Fruit Cases Act Amendment Bill, and Lands Act Amendment Bill. Among the more important agricultural measures that have already become law is the Agricultural Education Act, and by the time this reference appears it is presumed that all the agricultural measures of this session will have become listed among our statutes.

The Primary Products Pools Bill.

As outlined by the Minister for Agriculture (Hon. W. N. Gillies) in the course of his second reading speech, this Bill is of considerable importance to Queensland. Its object is to give the Governor in Council power to proclaim any primary product a product within the meaning of the Act, and to bring into existence a committee or pool to control that industry. It is not experimental, for there are already in existence two Pool Acts in this State covering selling operations in wheat and cheese. The measure is a simple one, and is based on the Wheat Pool Act. The success of the wheat and cheese pools has justified the enactment of general pooling legislation. One of the advantages of the pooling system is that it is an extension of the co-operative principle, bringing the whole of the producers in any section of the agricultural industry together, enabling them to handle their commodity in bulk, financing their business as it can only be financed under such a scheme, regulating the market, reducing intercepted charges, and eliminating speculation in farmers' produce. A study of our existing marketing system discloses the illuminating fact that probably only a little over 30 per cent. of the price paid by consumers for commodities produced by the farmer is received by the farmer. The principal clause of the Bill is clause 3, which provides that—

> "The Governor in Council may from time to time by Order in Council declare that any grain, cereal, fruit, vegetable, or other product of the soil in Queensland, or any dairy produce or any article of commerce prepared other than by any process of manufacture from the produce of agricultural or other rural occupations in Queensland, is and shall be a commodity under and for the purposes of this Act."

"The Government do not wish to force a pool on any section unless the majority of the growers require it, and they think that it is quite sound to make the minority of 25 per cent. agree to the pool when the other 75 per cent. require it," declared Mr. Gillies in the course of a further explanation of the provisions of the measure.

The Irrigation Bill—Dawson Valley Scheme.

The purpose of this Bill is to obtain the necessary Parliamentary sanction to go on with the preliminary work of investigation in connection with the Dawson Valley scheme, and also to provide machinery for the proper control of schemes of that kind. In the course of the discussion on the second reading, the Treasurer (Hon. E. G. Theodore) said, in relation to the Dawson Valley project, that it had all the potential advantages of a very successful scheme. "It is possible," continued Mr. Theodore, "to store a large quantity of water at a comparatively moderate expenditure. The site of the dam has all the natural features required for the accumulation and storage of water, which will not be very far distant from the land to be irrigated. The whole of the land embodied in the scheme and coming within the influence of the scheme will be served by gravitation from the storage supply. The irrigable land is very extensive. It is of high-class quality, and there will be more land than there is water to supply, so there is no deficiency of irrigable land. Looking at it from the point of view of soil analysis, location, distance from ports, and everything else, it should result in a highly successful irrigation scheme."

Fruit Standards and Packing.

Speaking on the Fruit Cases Act Amendment Bill, the Minister for Agriculture (Hon. W. N. Gillies), who had charge of the measure, remarked on the difficulty of setting up standards for some of our fruits, but efforts would be made to set up standards for all our leading fruits. The Bill provides for the cross packing of bananas in standard cases containing 3,564 cubic inches. The Cavendish variety will be graded in three qualities. Choice bananas are to be of a minimum length of 9 inches with a minimum circumference of 5 inches, the fruit to be free from blemish. First grade bananas are to be of a minimum length of 7 inches with a minimum

circumference of 4 inches, and so on. "We have been able," Mr. Gillies continued, "to profit by experience with regard to legislation in the South dealing with standardisation of fruit. I am sure the Bill will make for the benefit of the producers, and I think the consumers will also benefit, too."

Butter and Cheese Production.

Some striking figures illustrating the expansion of the dairying industry in Queensland were quoted by Mr. F. M. Forde, M.L.A., in the course of a speech on the Primary Products Bill recently. After referring to the wide disparity between the prices of Australian butter and of the dairy products of other countries on the London market as a result of a lack of a complete oversea selling organisation, Mr. Forde said that the dairying industry is of growing importance to Queensland, and its protection and encouragement are very necessary. From the Department of Agriculture and Stock he had received some very interesting tables showing the annual production and value of butter and cheese in Queensland since 1915. The information he received is tabulated as under—

	Queensland Butter Production. lb.	Value. £
1915	25,456,714 ..	1,560,359
1916	28,967,279 ..	2,051,848
1917	38,930,690 ..	2,818,419
1918	32,371,575 ..	2,765,071
1919	26,213,514 ..	2,129,848
1920	40,751,373 ..	5,093,922
1921 (estimated) ..	58,165,352 ..	4,725,935

	Queensland Cheese Production. lb.	Value. £
1915	4,383,410 ..	178,076
1916	8,495,825 ..	345,143
1917	11,142,114 ..	452,648
1918	8,636,700 ..	386,855
1919	8,296,318 ..	388,889
1920	11,512,262 ..	623,580
1921 (estimated) ..	13,079,124 ..	667,579

The Queensland Poultry Industry.

In the course of his annual report, the Poultry Instructor (Mr. J. Beard) remarked that, with the exception of one or two districts, he found the poultry industry in a very flourishing condition. This was noticeable in the increased number of poultry farmers and stock, and the larger quantities of eggs coming on to the market. The increase for July over the corresponding month of last year was 54 per cent. and August, 60 per cent. Prices were from 15 per cent. to 20 per cent. higher than last year and these advanced values are accounted for by the stronger Southern demand for Queensland eggs. In the second half of August, over three-quarters of a million eggs were consigned to Southern markets. Further large shipments followed. The local demand was heavy and comparatively few were stored. A preliminary estimate of the cost of oversea export has been made and the deduction stresses, in the instructor's opinion, the unwisdom of shipping to England at present prices. The charges work out at 15s. 6d. per case, or 7½d. per dozen, and this, added to present local prices of 1s. 1½d. per dozen, means that eggs, to make good, would require to be sold at not less than 1s. 9d., and this price would not quite cover insurance and breakages in transit. There is no indication at present of opening a dressed poultry trade with London. Apart from shipping difficulties, there is to-day no Queensland surplus available for export. The existing supply cannot square with the local demand, and first-grade poultry is worth as much in Brisbane as in London without allowing for freight and other charges. Fully 80 per cent. of Queensland fowls are of the Leghorn breed, which does not produce a bird favoured at Smithfield. The one great drawback to the industry is the continued high cost of wheat and mill offals. Some of the wheat which has come under official notice is quite unsuitable for fowl feed. It is suggested that wheat should be released when it is sound and wholesome and not kept in the dumps until it has become almost useless, for poultry, to do well, must have the best of food.

Concerted Action and Compulsory Powers—A New Zealand View.

"Under united control we shall have reduced freights, reduced handling charges, reduced insurance costs, regulation of shipments, organisation of sale in England, and a complete system of advertising our produce in Home markets. Control of our produce is absolutely essential to success." Mr. E. Newman, a member of the New Zealand Parliament, thusly expressed himself ("Dominion," 16-9-22) at a meeting

of farmers in New Zealand recently. Continuing, the speaker advocated the establishment of one board with subsidiary boards for meat, wool, and butter, with power to bring all producers into line. Such a scheme would be absolutely useless without unanimity, and unanimity would be impossible without compulsory powers. There were always some people who liked to gain advantage over their neighbours, and that must not be permitted. He could not understand opposition to compulsion. Such a board would be appointed by the producers and would have no aim or object except to protect and promote the best interests of the producers. The New Zealand farmers' choice rested between compulsory control by means of a producers' board or working for the benefit of the shipping combine for the rest of their lives. One of the good results of the war was that it brought all shipping contracts to an end at the same time, so rendering combined action by producers now possible. Probably, that was the first thing the shipping combine would try to alter, an effort that producers must resist and fight to a finish. In that, wool, meat, and dairy producers must act together.

Co-operation in California.

Co-operators in the fruit business turn naturally to California for examples of success in producers' combination, for there, to-day, and in America generally, agricultural co-operation has come to be accepted as a precept of progress. In deciduous crops, Californian orchardists have made a co-operative start with the citrus crop and, after many ups and downs, due to lack of solidarity among growers and the big fight put up by the middlemen, the movement was eventually consolidated, and has done more than anything else to stabilise prices and guarantee the producer a remunerative return for his fruit. Peach and apricot growers, raisin and fig growers, prune and olive growers have all been working along similar lines in recent years, but the deciduous fruits are so much more difficult to handle than the citrus that anything like a "get-together" movement among all the sections was for long declared to be impossible, yet by the latest mails from San Francisco we have received advices which demonstrate the fact that nothing is impossible to any body of producers who, under efficient leadership, set their minds on building up their industry by honest methods.

By careful organisation, the deciduous orchardists have formed what is virtually a combine, which hopes to control production, shipments, and prices by keeping as much as possible of the traffic out of the hands of the middleman, and, in the end, dealing directly with the consumer wherever possible. This, it is believed, will result in lower prices for peaches, apricots, cherries, pears, apples and other deciduous fruits, as it has resulted in the past in more reasonable cost to the consumer of oranges, lemons, and grape fruit.

The price of peaches has been fixed on a basis of present production costs, and present supply and demand, at about £12 a ton for No. 1 cling peaches; £6 a ton for No. 2 clings; £9 a ton for Lowell freestones, and £8 a ton for all other freestones. This price, the producers hold, will bring them a profit, while lowering the cost to the consumer, and, at the same time, guarantee disposal of the production to all the growers.

The Peach Growers' Association was organised only last December, and now represents about 62 per cent. of the annual peach crop of California, valued at these prices at £2,500,000 for 1922. Prices of peaches have varied from £22 a ton in 1920 to £7 last year, and the California Canning Peach Growers organised to put a stop to such fluctuations in price and to speculation in the fruit by middlemen, thereby robbing the consumer, and preventing the producer from getting a fair price. To do this, it was held necessary to provide a standardised price each year for the crop, which is reported as normal this year.

The prune crop, probably, will be the best and largest of all the deciduous fruit crops in California this year, according to the director of the California Prune and Apricot Growers' Association, which has been at work for many months endeavouring to standardise production, shipments, distribution, and prices, so that both producer and consumer may get a "square deal" on the crops with which it deals.

There is one vital point behind this great forward movement that needs to be stressed at the moment in Australia, and in Queensland particularly, and that is that its present progress was only made possible by the growers "signing up." Instead of talking volubly and vehemently about loyalty, rights, principles, and other more or less vague abstractions, the Californian growers have signed contracts to sell only through their own co-operative concerns, whatever the price, for a period of five years. Until the majority saw the wisdom of sticking together in this way, little progress was made, as the middleman was able to get in and play one off against another. When we are prepared to profit by the experiences of other and older countries, who have overcome disabilities and difficulties similar to those with which we are confronted to-day, the establishment of a sane selling system will surely follow.

Standardised Canned Products—The British Market.

Major E. A. Belcher, leader of the British Empire Exhibition delegation, speaking at Melbourne recently, advocated a more extensive and scientific advertising of Australian goods in Britain. He said that he believed that there was just as big a future for Australian canned and dried fruits in Britain as for Australian manufactured goods. Dealing with the question of unattractive packing and labelling of Australian goods, he said that California had forgotten more than Australia had begun to learn about the marketing of canned fruits, although the quality of the Australian article was equal, if not superior, to the Californian. He warned Australian meat exporters against competition from Uruguay in the future. Before long, Uruguay would be as formidable a rival as the Argentine. Australia should try and increase her output tenfold in the next few years. In fruit, if we could produce a definitely standardised article equal to what he had recently tasted, and could retain sufficient control over its export to prevent a bad article being exported, there was no limit to the amount Great Britain and Europe could absorb. Even at the cost of Government supervision, it was better to have some standardisation and have nothing but the best stuff going out of Australia.

Co-operation and Common Honesty.

The present season marks the turning-point for fruitgrowers, says California's Professor of Rural Institutions, who further declares that the growers should more than ever attempt to produce fruit to please the consumer, which, of course, places emphasis on quality production. He thinks that with the aid of co-operative marketing the growers will be able to secure a reasonable price for all fruit of the better grades, but questions whether, under any circumstances, they can secure a satisfactory profit from inferior grades. The influence of the "buyer's market," he believes, will be sure to make itself felt; and the producer of poor fruit will be the one to suffer.

In Australia, the same thing is becoming more and more evident. The public want plenty of fruit, but they are so often "taken down" by receiving inferior stuff that many of them refrain from buying more than a minimum. The retailer is sometimes to blame for this state of affairs, but just as often it is the grower who is at fault. He continues to grow and to send to the market fruit that is much below the standard set by consumers. When co-operation comes, in addition to getting better and more regular prices for the producer of good fruit, it will, undoubtedly, force the careless grower to improve his methods or to get out of the business. True co-operation is only for the honest farmer.

Dehydration.

The question of suitable and economical methods of artificially drying various fruits, vegetables, and maize is one that has for some time engaged the attention of the Minister for Agriculture (Hon. W. N. Gillies). It will be remembered that, last year, Mr. Quodling, the Director of Agriculture, went South to consult with the firm of Metcalfe and Sons, who designed and built the grain elevators for the New South Wales Government. This firm subsequently submitted plans and estimate of a comprehensive cleaning, drying, and storage scheme for maize in the Atherton District which is the largest maize-growing district in the State. The matter was fully considered at the time, but the estimate (£170,000 sterling) was considered prohibitive. Mr. Gillies took the opportunity recently of discussing this matter personally with Mr. Carter, the engineer to Messrs. Metcalfe and Sons. Mr. Gillies believes now that a less expensive scheme than the original one submitted would meet present requirements, and in view of the suggested Maize Pool, proper storage facilities will, in his opinion, be necessary, not only in the North, but at Kingaroy and other centres, and to this end further investigations are being made. On the subject of dehydration of fruits, which has made such rapid strides in California, Mr. Gillies, in the course of a recent Press interview, referred to an article in Bulletin No. 337, published by the University of California, entitled "Some Factors of Dehydrater Efficiency." This article was written by W. V. Cruess and A. W. Christie. The writers point out that in the course of the past two years more than 150 dehydraters have been built in California. There are also in existence not less than 150 driers of less modern design built before 1919. Some of these were erected merely as an insurance against rain damage, but many have been used in place of sun-drying, as in prune and apple drying. Many different types are represented and several different systems of heat production and heat conveyance are employed. Observations have been made upon many of these plants. In several cases, direct comparisons of important types were possible. Because of the improvements that are rapidly being made in the design, construction, and operation of dehydraters, this publication must be considered in the nature of a progress report. It is issued in the hope that the results, which in many instances are sufficiently conclusive, will be of value to operators and prospective purchasers or builders of dehydraters. Tables are furnished showing

the first cost of a number of different types of plants and the working cost of same, and it would appear from the estimates given that the actual cost per green pound of fruit runs from one-third of a penny to twopence; this, however, is for a short season of about two months. In the summary and conclusions, the writers point out that a completely equipped and satisfactory dehydrater can be built for $500 (£100) or less per green ton capacity per twenty-four hours. They also say that the air-blast tunnel type of dehydrater is the most economical to operate in regard to both fixed charges and operative costs.

Co-operation amongst Poultrymen.

In a back street of Brisbane a little co-operative trading concern has taken root and gives every promise of developing into a strong and healthy growth. This co-operative effort has been launched by the N.U.P.B.A. Co-operative Society Limited which, in its turn, is an offshoot of the Queensland Branch of the National Utility Poultry Breeders' Association of Australia. There are many poultry clubs and societies in Queensland which exist solely for the show bench, but as far as is known the particular association referred to is the only one which has for its object the development and advancement, from the commercial standpoint, of the poultry business. For many years the Association has been steadily at work educating its members by lectures, demonstrations, and other practical means. The co-operative society was formed some little time ago and is already showing marked virility. Its object is to supply the wants of the poultry farmer and to handle his products to the best possible advantage. This year the society is making an effort to grapple with the surplus egg question and is now busily engaged preparing eggs for export. Large orders have been placed for the special cases and material required for the packing of the eggs for overseas carriage, and scrupulous care has been taken to ensure the eggs arriving in a condition which will do credit, not only to the society, but to the State. Size and quality have been taken into account and only the very best are allowed to be shipped. Each case is clearly marked "Produce of Queensland," and it is confidently hoped and believed that this experiment will make a distinctly favourable impression when the consignment is opened up in England. The first shipment was made recently, and this will be followed by others at regular intervals while the season of glut lasts. It is hoped, by this means, to gradually improve the position of the egg farmer, and that there is ample opportunity for improvement there is not the least doubt. With new laid eggs at 1s. per dozen, less commission, cases, railage, and other charges, the poultry farmer may well ask where is his basic wage coming from. Probably, there is no business which provides so many failures as does poultry farming, and there is no doubt that the poor returns for the labour and care involved are mainly responsible for this; and until the poultry farmer learns the stern lesson of organising, there can be little improvement. On every hand the advantages of successful organisation are apparent. It is not hard to remember when the dairy farmer had to be satisfied with 9d. per lb. or less for butter, and when the wheatgrower had to accept a price which would hardly pay working expenses in a bountiful season. The experience was bitter, but its teachings have not been in vain, and surely the egg-man is wise enough to see wherein his salvation lies. The bitter experience has been his for long enough, and now is his opportunity to make the move. The N.U.P.B.A. Society has stepped into the breach and is making an attempt to bring about the desired change. Its ideals are of the highest, and its success of national importance. Queensland is admirably adapted for poultry farming, and there is no reason why the industry should not grow to be one of the greatest in the land.

The Queensland Producers' Association.

Already over 5,000 farmers have been enrolled in 250 local producers' associations and these numbers are being added to largely every week. The advantages of a State-wide scheme of organisation, backed by statute, are so obvious and the powers that are now placed in the hands of the producer so wide, that it is difficult to imagine a reason why any farmer should remain outside the association. According to the Act governing the Queensland Producers' Association, the present Provisional Council must be superseded on 25th March next by a Council elected by district councils representing the local producers' associations. It is very important that every rural centre should have a voice in the election of councillors, because all primary producers will be subject to the provisions of the Act. The dates fixed for the completion of various stages of the elections are:—Nomination of candidates, 6th January; election of district councils, 3rd February; declaration of results, 17th February; first meetings of district councils, 3rd March. Full particulars are posted at all country railway stations.

Acknowledgment.

For the photographs of prize-winning cattle reproduced in this issue, we are indebted to the "Live Stock Bulletin."

General Notes.

QUEENSLAND COTTON PRODUCTION.

Table showing the Area, Production, and Export of Cotton from Queensland from 1860-1921.

Year.	Area.	Produce.	Exports.	
	Acres.	Lb.	Lb.	£
1860	14	Not collected.	..	..
1861	395	,,	2 bags	4
1862	392	,,	14,344	1,423
1863	2,021	,,	31,557	3,056
1864	479	,,	38,730	4,186
1865	478	,,	145,820	12,197
1866	2,884	,,	196,704 10,568*	19,218 400
1867	8,149	,,	412,941	26,631
1868	11,454	,,	1,809,628	68,929
1869	14,427	,,	1,118,899	51,217
1870	14,674	,,	1,630,755	73,437
1871	12,963	,,	2,567,318	78,209
1872	12,002	,,	1,486,987	59,774
1873	9,663	,,	1,375,216	48,673
1874	4,149	,,	979,875	32,819
1875	1,674	,,	314,454	8,162
1876	573	,,	137,812	3,541
1877	276	90,450	221,689	6,940
1878	37	10,500	43,532	1,216
1879	105	30,423	26,261	664
1880	619	125,736	108,260	3,581
1881	973	183,488	266,289	8,839
1882	1,082	243,232	248,029	7,932
1883	316	70,020	80,689	3,430
1884	49	12,050	28,856	1,066
1885	50	14,968	19,241	608
1886	15	2,100	1,548	45
1887	..	..	..	..
1888	..	..	..	..
1889	1	7	..	..
1890	16	5,315	..	..
1891	90	48,746	15,396	488
1892	717	212,370	38,618	1,061
1893	191	29,353	88,559	1,921
1894	100	54,801†	1,426	56
1895	494	269,110	3,860	105
1896	280	141,032	..	..
1897	48	19,977	..	..
1898	1	50	..	..
1899	..	..	..	..
1900	..	..	..	..
1901	..	..	..	..
1902	8	1,600	..	..
1903	2	1,500	..	..
1904	30	25,832	..	..
1905	171	113,008	..	..
1906	138	77,381	20,450	583
1907	300	109,294	71,053	1,259
1908	540	117,521	15,561	440
1909	509	129,245	11,832	457
1910	460	151,438	10,531	655
1911	605	186,894	2,267‡	141

QUEENSLAND COTTON PRODUCTION—*continued.*

TABLE SHOWING THE AREA, PRODUCTION, AND EXPORT OF COTTON FROM QUEENSLAND FROM 1860-1921—*continued.*

Year.	Area.	Produce.	Exports.	
	Acres.	Lb.	Lb.	£
1912	441	150,414	12,880	650
1913	214	35,230	82,734	2,147
1914	134	20,336	7,583§	372
1915	72	12,238	..	..
1916	75	24,264	5,217	196
1917	133	118,229	..	..
1918	203	166,458	..	..
1919	72	37,238	406	7
1920	166	57,065	..	..
1921	1,944	940,126	..	..
	858	Unproductive	..	..

* Unginned.

† Previously recorded as ginned; now unginned.

‡ The collection of Interstate transfers was discontinued by the Customs authorities in September, 1910.

§ Six months. From 1914 the export figures are for the year ending 30th June.

PLATE 73.—FIFTEEN-MONTHS-OLD BADILA CANE, CUTTING PROBABLY AT THE RATE OF FIFTY-FIVE TONS PER ACRE, GROWN ON MR. W. TOATES'S FARM, N.Q., ON A SMALL PATCH OF NEW SCRUB LAND.

Answers to Correspondents.

Paralysis in Young Pigs.

D.B. (Toogoolawah)—

Your pigs are evidently suffering with paralysis, which may be brought on by several causes:—viz., rheumatism, worms in the kidneys and surrounding parts, or by overfeeding young pigs on an exclusive diet of corn and water.

Treatment ("Pig Raising in Queensland," E. Graham and H. C. Quodling, p. 46):—If due to rheumatism, see that the pigs are housed at night in a dry place, and allowed to sleep on wood flooring instead of on concrete or earth. Give daily, salicylate of soda 15 to 30 grains, and bicarbonate of potash 1 to 2 drachms, in the food or as a drench.

If due to worms, give, in the food or as a drench: One teaspoonful of oil of turpentine, 20 drops of liquid perchloride of iron, and three (3) or four (4) oz. of raw linseed oil. This is sufficient for 50 lb. body weight. It should be given after the animal has been fasting for some hours, and can be repeated several times, with an interval of three or four days.

When due to feeding, as mentioned above, stop the corn, and give once daily in a mixed diet, or in milk, 1 dessertspoonful of the following powder for every 100 lb. body weight, after it has been well mixed and powdered:—Sulphur, 2 oz.; sodium bicarbonate, 4 oz.; sodium sulphate, 2 oz.; black antimony, 2 oz.; sulphate of iron, 1 oz.; wood charcoal, 2 oz.

Lice on Pigs.

"TINGOORA"—

Pigs are often troubled with a species of louse commonly known as the pig-louse (*Haematopinus suis*). This species is an active blood-sucker, and is among the largest of lice, measuring one-fifth inch in length. It is a flat, oval insect, with a long, narrow head, and its legs end in long claws, which enable it to move rapidly among the bristles of the pig. The pig-louse spends its entire life on the body of the host, and attaches its eggs or "nits" to the bristles. While it may occur on all parts of the body, the favourite spots are within the ears, behind and in front of the ears, on the breast, and in the armpits.

For the destruction of these parasites, dipping, spraying, or hand-dressing may be resorted to. Dipping is usually more convenient in the case of young pigs, and spraying for adult ones. Various substances may be used as dips or sprays. Smythe recommends Jeyes' fluid, diluted 1.60 with water. Other substances are creoline (5 per cent. solution), and nicotine extracts, diluted according to the directions of the manufacturers. Treatment should be repeated after about a week, in order to destroy lice that may hatch out from remaining eggs. The sleeping quarters of pigs should be thoroughly cleaned and disinfected at the same time as dipping or spraying takes place. For hand-dressing, the parts infected with nits and lice may be rubbed with a cloth soaked in paraffin or a mixture of paraffin and linseed oil (1:1). An ointment prepared by thoroughly mixing equal quantities of paraffin, sulphur, and lard is also effective.

If the pigs are running in enclosed camps a little crude oil, sufficient to form a thin layer on top of the water, may be poured into the wallow about every ten days. American pig farmers find this a useful method of checking lice on pigs. Another method is to tie a sack or other coarse cloth around a post at a proper height, so that the pigs may rub against it; the sack is periodically saturated with crude oil.

Green Cane Top Silage.

H.W. (Mackay)—

The Director of Sugar Experiment Stations (Mr. H. T. Easterby) advises as follows:—

Experiments in this direction were carried out by the Bureau at the Sugar Experiment Station, Bundaberg, and this silage is now made there every year. The feeding value is low, as will be shown by the following analyses supplied by the Agricultural Chemist, Mr. J. C. Brünnich. It is an assistance during dry weather, mixed with other foodstuffs:—

Sugar-cane Tops Ensilage.

	Per cent.
Moisture	78.09
Dry matter	21.91
Crude protein	1.34
True protein	0.66
Ash	2.72
Crude fibre	8.87
Crude fat	0.79
Carbohydrates (etc.) by diff.	8.19
Total nitrogen	0.214
Proteid nitrogen	0.105
Amido nitrogen	0.075
Ammonia	0.034
Acidity as lactic acid	1.73

The food value of this ensilage is extremely low as compared with corn silage, or Soudan grass silage, &c., on account of the low protein contents.

Nitrogenous concentrated foodstuffs will have to be used in combination in order to get complete rations for stock.

Marketing Intelligence.

W.L. (Ambrose)—

A system of supplying complete and authentic market information direct to Local Producers' Associations at least once a week is now being devised by the Council of Agriculture. Obviously, a Journal published only once a month is of no great value as a vehicle for marketing intelligence. Timeliness and *absolute accuracy* are, of course, essential in market reports.

Tree Lucerne.

J.H.Ry. (Pittsworth)—

Tree lucerne seed may be obtained from most seedsmen. The retail price is about 1s. per oz. Seed should be soaked in water before sowing, either in boxes or in the permanent position. It is of fairly rapid growth, reaching 10 or 12 feet in the course of about three years, and bears a profusion of white pea-shaped flowers, useful where bees are kept. It stands frost and should do well on the Downs. As a fodder it is an "also ran" compared with lucerne proper, which is easily the king of fodders on the Downs.

Lime-Sulphur Wash.

"OLD SUBSCRIBER" (Edmonton)—

A concentrated solution of lime and sulphur is now manufactured in quantity, and is sold reasonably and of special strength. It is considered generally more satisfactory for orchardists to buy the concentrated mixture and dilute it to their own requirements than to go to the trouble (and it is a disagreeable job!) of making it themselves. See "Citrus Culture" (A. H. Benson) 7th Edition, p. 69, a copy of which is being posted direct.

To Soften Hides.

W.C.B. (Wondai)—

There is no special process for softening untanned hides. The usual tannery practice is to soak them in water for, say, twenty-four hours.

Coffee Berries.

"YARWUN" (Yarwun)—

We do not know of any rapid process of removing the thin inner skin attached to coffee berries. When dry, this thin skin is not detrimental to the berry as far as roasting is concerned.

Notice of Scrub Burns.

"FARMER" (Mount Larcom)—

It is necessary to notify your neighbours as to your intention to fire your falling and advise them of the date upon which you have decided to burn. You would naturally exercise the greatest possible care in keeping the fire within bounds. You would certainly be responsible for any damage to neighbours' property arising out of the careless use of fire and neglect to give reasonable notice and to take all reasonable precautions to prevent a fire spreading.

Operations of Rural Banks and Credit Systems.

T.F. (Boonah)—

A series of articles on rural banking systems and co-operative credit associations are now in course of preparation for publication in the Journal.

Cassaba Melon Seeds.

We are very grateful to the subscribers who so generously responded to our request for new seeds for this season's sowing. Their kindness and courtesy have enabled us to meet all requests on our list.

Cotton Photograph.

F.A. (Hut Creek, Ambrose)—

The photograph of your cotton field was not sharp enough, and was therefore quite unsuitable for reproduction. Sorry. When next you take a picture send us the negative, from which we shall be able to take a print up to our requirements. Thanks.

Farm and Garden Notes for November.

FIELD.—The recent unfavourable weather experienced throughout the wheat areas must naturally affect the ultimate yields. Areas in many parts of the Maranoa are already beyond rain redemption. Harvesting on the Downs may be expected to commence in the latter part of October; but, unfortunately, it is not likely to extend over any lengthy period. Growers who have suffered a seasonal setback would be well advised to push on with recultivation for the purpose of making a saver out of cotton. From mid-October until the beginning of November is the cotton planting season, and delay in districts usually subject to early frosts means a risk of failure to secure a cotton rake-off.

Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plant. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kafir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghum have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necesssary during the winter months.

Orchard Notes for November.

THE COASTAL DISTRICTS.

November is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely-ground phosphatic rock to the acre, and, if the soil is deficient in lime, a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young pawpaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack if moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as

they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit, it appears to be covered with a grey dust, and if the fruit is examined with a good lens it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for Downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruits that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruits profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully and, on its first appearance in a district, all ripening fruits should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	OCTOBER.		NOVEMBER.		DECEMBER	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·34	5·50	5·4	6·8	4·50	6·32
2	5·33	5·51	5·3	6·9	4·50	6·33
3	5·32	5 52	5·3	6·9	4·50	6 34
4	5·31	5·52	5·2	6 10	4·50	6·35
5	5·29	5·53	5·1	6·11	4·50	6 36
6	5·28	5·53	5·0	6 12	4·51	6·36
7	5·27	5·54	5·0	6·12	4·51	6·37
8	5·25	5·54	4 59	6 13	4·51	6·38
9	5·24	5·55	4·59	6·14	4·51	6·38
10	5·23	5·55	4·58	6·15	4·51	6·39
11	5·22	5·56	4·57	6·16	4·52	6·39
12	5·21	5·56	4·57.	6·16	4·52	6·40
13	5·20	5·57	4·56	6·17	4·52	6·40
14	5·19	5·57	4·56	6·18	4·52	6·41
15	5·18	5 58	4·55	6·19	4·53	6·41
16	5·17	5 59	4·55	6·20	4·53	6·42
17	5·16	5·59	4·54	6·20	4·53	6·43
18	5·15	6 0	4·54	6·21	4·54	6·44
19	5·14	6·0	4·53	6·22	4·54	6·45
20	5·13	6·1	4·53	6·23	4·55	6·45
21	5·12	6 2	4·53	6·24	4·55	6·46
22	5 11	6 2	4·52	6·24	4·56	6·46
23	5·10	6·3	4·52	6·25	4·56	6·46
24	5·9	6 3	4·51	6·26	4·57	6·47
25	5 8	6·4	4 51	6 27	4·57	6·47
26	5 8	6 5	4·51	6·28	4·58	6·47
27	5·7	6 6	4·50	6 28	4·59	6·48
28	5 6	6 6	4·50	6 29	5·0	6·48
29	5·5	6 7	4·50	6 30	5 0	6·49
30	5·5	6·7	4·50	6 31	5·1	6·49
31	5·4	6·8	...	...	5·1	6·49

PHASES OF THE MOON, OCCULTATIONS, &c

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when "Summer" Time is not used.

6 Oct.	○	Full Moon	10 58 a.m.
14 „	☽	Last Quarter	7 55 a.m.
20 „	●	New Moon	11 40 p.m.
27 „	☾	First Quarter	11 26 p.m.

Apogee on 5th at 6 a.m.

Perigee on 20th at 2.42 a.m.

An occulation of Delta Tauri will take place on 10th October about a quarter past 9. With binoculars or a small telescope this will be an interesting sight as the Moon will be in the group of stars called the Hyades, of which Aldebaran is the principal star.

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5 Nov.	○	Full Moon	4 36 a.m.
12 „	☽	Last Quarter	5 52 p.m.
19 „	●	New Moon	10 6 a.m.
26 „	☾	First Quarter	6 15 p.m

Perigee on the 17th at 10.6 a.m.

Apogee on the 29th at 5.24 a.m.

Delta Tauri will again be occulted about 3 a.m. on the 7th; also Eta Virginis on the 15th about 9.30 p.m.; and the planet Saturn on the 16th about 5 p.m. when the Moon and it are far below the horizon.

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4 Dec.	○	Full Moon	9 24 p.m.
12 „	☽	Last Quarter	2 41 a.m.
18 „	●	New Moon	10 20 p.m
26 „	☾	First Quarter	3 53 p.m.

Perigee on 15th at 1.30 a.m.

Apogee on 27th at 2.6 a.m.

Delta Tauri will be occulted about 10 a.m. on the 4th, when the Moon and star are below the horizon, but on the 31st, when it will be occulted about the time of sunset, an interesting observation of the star's reappearance may be possible in the twilight.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.